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LECTURES.

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Colonel the Hon. J. LINDSAY, and Vice-Admiral Sir T. HERBERT, K.C.B., in the Chair.

ON FIELD FORTIFICATION.

By Major F. Griffiths, R.F.P. Royal Artillery.

Having been honoured by a request from the Council of this Institution to deliver two Lectures upon Field Fortification, and feeling that the subject is one of paramount importance to every officer who is desirous of distinguishing himself in the service of his country, I thought it my duty to accept the invitation. I confess that I did so with some reluctance, as many officers might be present, both senior to myself and more experienced in warfare; fortunately, there are also other officers now here who are in the mid-day or opening of their career, who may glean some information from my brief exposition of a branch of science too little studied by many soldiers; and I perceive, with much gratification, that there

are present many members of that valuable and justly appreciated class the non-commissioned officers of the British army.

The subject of field fortification is old; almost yearly it has been introduced in this room; and difficult indeed will it be to give variety to the elucidation of a science which, both theoretically and practically, has from the earliest times been studied by every true soldier.

It will be interesting to trace the progress of fortification from by-gone ages to the present period, and I shall, therefore, briefly introduce to your notice a few instances of the developement of the science of attack and defence, and of the advantages derived from the art of fortification, by some of the most distinguished commanders of antiquity.

[*The Lecturer then referred to the early mention made of fortified places in Holy Writ (see Second Book of Chronicles, chapter ii.) and read an interesting account of the siege of Jotapata.*]

Fenced Cities.

It appears to have been the custom, in the earliest ages, for each community to dig a trench around them, the earth from which was thrown up into a mound, and so generally was this the case that to build a city, and to fortify it, are synonymous terms in many of the oriental languages. The next step was to raise a kind of scaffolding upon the mound, from which missiles might be directed upon any assailant; and at length walls were built within the deepened trench, which, if lofty enough to render scaling impracticable, fully answered their purpose; that being the only mode of attack from which at that time any danger could arise. This mode of defence must have reached considerable perfection at an early period, for in the time of Moses and Joshua we find that the Canaanites dwelt in cities "fenced up to Heaven." In besieging a city, if the assault failed, or was deemed impracticable, and the siege seemed likely to be of long duration, the besiegers drew a trench round the spot they occupied, and, with the earth thrown out, raised a bank or mound, which they gradually advanced, in an oblique direction, towards the city walls, whose height it often equalled or surpassed. From this position they poured showers of

arrows and stones into the place, and the garrison exerted themselves first to prevent the construction of the bank, afterwards to drive the assailants from it. When the mound had been carried nearly to the walls, so that the archers and slingers, supported by some *catapulta* and *balistæ*, might occupy the attention of the garrison, bodies of heavily armed men advanced, covered by a moveable pent-house, and dragged with them the battering-ram. When a breach in the wall was effected, the garrison frequently erected another wall, inside the first, in doing which they tore down the contiguous houses, and employed the timbers in its erection. This, being generally weaker than the first wall, was speedily overthrown, and the besiegers forced their entrance into the doomed city.

When the ancients attempted to capture a place of strength by storm, or assault, they surrounded and attacked it on all quarters at once; this the Romans termed "*coronâ cingere.*" The *corona* was single, double, or triple, as the strength of the place required, or the number of assailants allowed. If the *corona* was threefold, the first or innermost circle was composed of the heavy-armed foot, who always commenced the assault; the middle circle consisted of the *velites*, or light-armed, who with their slings, darts, and arrows, beat the defenders from their parapets, that the heavy-armed might carry on the assault with less opposition; the third and outmost body was made up of the cavalry. The army, being thus disposed, marched up to the attack, some carrying scaling-ladders, and others hurdles to fill up the ditch or moat; which being done, the heavy armed men formed themselves into the *testudo*, or military shell, and advanced to the attack. Lines of circumvallation and countervallation generally consisted of a double ditch and rampart, fortified with towers or redoubts, breastworks, and palisades. Some of these works were very extraordinary, particularly those of Julius Cæsar at Alesia, and of Publius Scipio at Carthage, and at Numantia. Those of Augustus Cæsar at Perusia were seven miles in circumference; the breadth of the ditch was thirty feet, its depth the same, and on the rampart stood fifteen hundred towers.

[*The Lecturer then read his detailed account of the siege of Tyre, captured by Alexander; and the meeting of the rivals Pompey and Cæsar, at Asparagium, in the vicinity of Dyrrachium.*]

The battle of Pydna (B.C. 586) is an instance of entrenching an army. On the arrival of Emilius in Macedonia, he found the king entrenched on the banks of the Enipeus, his right and left being covered by mountains, the passes of which were all well secured. After reconnoitring the position of the enemy, he dispatched some troops to dispossess the Macedonians of one of their stations on the heights, directing the officer in command, if successful in this operation, to move down into the plain in rear of the enemy. The heights having been carried by the Romans, Perseus relinquished his position, and fell back towards Pydna, on the banks of the Aliacmon, where he resolved to hazard a battle. The two commanders were equally desirous of the encounter, but the formidable appearance of the combined body of Macedonian spears in some measure shook the confidence of Emilius Paulus, who ordered a halt, and, being determined not to recede from the ground he then held, directed the front line to remain under arms, and ready for attack, while those in the rear threw up an entrenchment, consisting of a breastwork of considerable strength, behind which the army retired, and completed the fortification of the camp in the usual manner. It is unnecessary to detail the movements in the subsequent battle, in which the Macedonians were routed with a loss of twenty thousand men.

Referring to the campaigns of Cæsar, let me bring before you further exemplifications of caution, science, and skill, developed in the strategical and tactical operations of this renowned commander.

Cæsar's Second Campaign in Gaul (B.C. 57).

A host of enemies were arrayed against the Romans, but Cæsar's heart quailed not: his legions advanced to the banks of the Axona, which they crossed; and, having formed an entrenched camp, resolutely awaited the attack of their multitudinous enemies. True military science was apparent in all the dispositions of the Roman proconsul, who, aware of the preponderating force of the enemy, and their reputation for superior prowess, trusted for victory not only to the valour and discipline of his troops, but also to the assistance of nature and art. His camp, placed on the summit of a gentle hill, afforded space in front for the evolutions of six legions; his rear rested upon the river, over which was a bridge covered by an earth-

work, and guarded by a detachment of soldiers. Two fresh legions were kept as a reserve within his lines. The principal danger was the risk of being outflanked by superior numbers; he therefore constructed a trench on each side of the hill, to a distance of 400 paces, erecting well-fortified works at the extremities, and supplying them with engines of defence. In furtherance of this exemplification of military art, nature contributed to the defence of the post selected for the Roman field of battle, for a morass was in their front, which would of itself form an obstacle to the advance of troops in compact and regular order. Brave as the Gallo-Germans were, they were also prudent and cautious, and, satisfied that the position of Cæsar was not to be attacked with any prospect of advantage, they vainly endeavoured to entice their antagonists from their judiciously strengthened post. The result may be briefly told —the Romans were successful in their operations: of the 290,000 men who faced and hoped to conquer the forces of Cæsar a large portion were destroyed, and the remainder were scattered in direful confusion throughout the seat of war.

Interesting as it might be to dwell longer on the record of the military operations of the ancients, I must now commence my descriptive survey of the various works comprised under the term "FIELD FORTIFICATION."

Let me first advert to the arrangements which are imperatively required in order to ensure a successful defence.

1st. Cover must be obtained to protect the defenders from the effect of the assailants' weapons.

2nd. In the attack, the enemy must be exposed to the full effect of the defenders' weapons.

3rd. Some natural or artificial obstacle should be rendered available to delay the advance of the assailants, and to keep them under the fire of the defenders of the position.

Bearing in mind the foregoing maxims, I shall, as briefly as possible, bring under your notice the principal field-works, and, by alluding to their relative advantages and disadvantages, their means of offence and defence, shall endeavour to impress upon your memory rules for constructing or attacking them.

Field Fortification is the art of constructing temporary works for

the defence of posts, villages, &c. in order that a small body of men may be able to resist the attack, or retard the advance, of an enemy superior to them in numerical strength. Recourse is therefore had to earthworks, a parapet, and, in some instances, a small glacis, being formed from the earth excavated from a ditch. With the exception of the interior slope of the parapet, which is revetted with fascines, gabions, turf, hurdles, or sand-bags, to retain the earth with but a slight inclination, the slopes of the field-works are usually the natural slope of earth—about 45 degrees.

The Parapet.

The first object to be taken into consideration is the construction of the parapet, this being a mass of earth thrown up around the post to be defended for the preservation of its troops. Its height and thickness are dependent on the nature of the ground, having also reference to the purposes for which it is constructed, and the nature of the ordnance that may be expected to bear upon it. The following dimensions are considered proof

Against Musketry.

3 feet, when of earth.		
6 inches	,,	stone.
12 inches	,,	fir.
5 inches	,,	oak.
9 inches	,,	brick.

Against Cannon.

4 feet, when of wood or brick.				
6 feet against 6-pounders, when of earth.				
9 feet	,,	9-pounders	,,	,,
14 feet	,,	12-pounders	,,	,,
18 feet	,,	18 and 24-pounders	,,	

The height of the parapet for effectual defence should be 7½ ft., allowing 3 ft. for the height of the banquette, and 4½ ft. above the tread of the banquette, to enable the soldiers to stand under cover while firing on the enemy. The breadth of the banquette should be 4 ft., except when intended to be lined two deep, in which case it must be 5 ft. wide. A more advantageous plan, with regard to

firing, is to post on the banquette the best marksman of the file, for continuous firing with two muskets, leaving the other man below to load them alternately.

The parapet of field-works is well defended when to every yard of interior perimeter a file of men is allowed; and, when cannon are to be mounted, 5 or 6 yards per gun are required. In order to have a good view of an enemy in his approach, the surface of the parapet is sloped outwards, this superior slope or plunge being directed towards the verge of the counterscarp, if this can be effected without thereby weakening too much the crest of the parapet. In the construction of the parapet there is, unavoidably, a space at the exterior and lower portion of it, which cannot be defended by the fire of men lining the parapet, and the extent of this space will evidently be dependent on the slope and height of the parapet. Consequently in works which have no flanks or flanking defence, an enemy having once passed over the ground where the direction of the superior slope and the natural surface of the ground meet, will cease to be exposed to fire on approaching the parapet. This is, of course, an insuperable objection to constructing works without flanking defences, if the post to be maintained is of importance and to be defended with any hopes of success. When guns are mounted in field-works, embrasures or openings are made in the parapets, through which the guns deliver their fire, or the ordnance is placed *en barbette, i. e.* elevated on traversing platforms, or raised sufficiently high to fire over the parapet. Embrasures should be from 16 to 18 feet distant from each other, the width of the mouth or outward part being from 7 ft. 6 in. to 8 ft., and the width of the neck or inward opening from 1 ft. 10 in. to 2 ft.

Reverting to the best mode of posting men for the defence of the parapet, I consider it desirable to instance the attack of the entrenchments at New Orleans in 1814. Had the English troops attacked New Orleans the day of their approach, it would have been captured with little difficulty. But delay was dangerous, for the Americans lost no time in throwing up an entrenchment, forming the parapet chiefly of bales of cotton and other materials ready at hand; and when their enemies approached this hastily-formed breastwork they were received with so steady and destructive a fire that a retreat

became unavoidable. The immediate cause of this repulse was the almost unerring aim of the defenders, who, with their muskets pointed, patiently awaited the close approach of their opponents. For this mode of defence they were well prepared by General Jackson, who directed them not to fire until they could distinguish the colour of the eye of the man selected for the deadly shot. Well did the Americans profit by this caution. When the discharge took place the soldiers appeared mown down, as it were, by a scythe. There was a melancholy cry from the fallen British, another murderous discharge from their calm antagonists, and after that the few survivors quitted the field—few indeed.

The next object of attention will be *the berm,* which consists of a space, or path, around the parapet, separating it from the escarp. The exterior slope of the work might be continuous from the termination of the exterior slope to the bottom of the ditch, if the soil would admit of the slope being made steep, thus rendering an escalade more difficult, otherwise this mode of construction would be disadvantageous; for, were the total slope that of the natural form, base equal to height, the assailants would have little difficulty in ascending it, and would thus oppose the defenders hand to hand. The object of the berm is not only to meet this drawback, but also to prevent the escarp giving way from the pressure of the parapet above it; and this is attained by making the berm about two feet in breadth. There is, however, one insurmountable objection to the berm; for, should the enemy clear the ditch, they are, when established on the berm, almost as well covered by the parapet as the men posted for the defence of the work. When the soil is good, and the parapet not more than eight feet in height, the berm may be dispensed with, the exterior slope to the bottom of the ditch being formed as steep as practicable by ramming and by sod work.

The ditch may be considered the main contributor towards the construction of field-works, for, without the earth excavated from it, a parapet sufficiently strong for a good defence could scarcely be erected. Moreover the ditch, from its breadth and depth, materially contributes to the difficulty of the enemy's assault. Its depth should never be less than six feet, its breadth, conjointly with its depth, being dependent on the quantity of earth required for the formation

of the parapet and banquette. The difficulty in crossing the ditch is greater in proportion to the less slope of the counter-scarp and of the escarp, especially of the latter, when the ditch is of considerable breadth. The slope of the ditch is dependent on the nature of the soil, and the height of the slopes. With common earth the base should be equal to the height; but, when dug in clay or loam, the base may be two-thirds the height.

In digging the ditch care is necessary to be taken in the excavation, otherwise the weight of the earth thrown up to form the parapet may cause it to sink or fall down. To prevent this, let the diggers commence the excavation one foot from the boundary of the ditch on each side, digging from one to two feet deep, according to the intended slope of the escarp and counterscarp. After this let them resume their digging one foot from the boundary of the excavation on each side, regulating the depth as before. The operation is to be continued until the ditch is of the depth required, when the angles of the steps are to be taken off, and the slope of the escarp and counterscarp perfected.

As the difficulty of the passage of the ditch is increased in proportion to its depth and breadth, it is advisable on some occasions to raise the counterscarp a few feet above the plane of sight, terminating the slope in the form of a glacis. This is, however, seldom required in the construction of small field-works, but it is very advantageous when applied to works much exposed to the fire of cannon, as it covers the parapet, and is very detrimental to the enemy during his ascent of the glacis when attempting the descent of the ditch.

I do not consider it advisable on the present occasion to enter into any detail of the minor additions to field-works, such as stockades, palisades, *trous-de-loup*, *chevaux-de-frise*, crow's-feet, abattis, inundations, and other obstacles. I shall therefore at once bring under your notice the principal field-works.

1. *The Redan, Flèche, or Arrow.* (*Figure* 1.)

This work, consisting of two faces, forming a salient angle, varying from 70 to 120 degrees, is the simplest of all field-works, and is constructed for the security of pickets, outposts, &c. to cover a

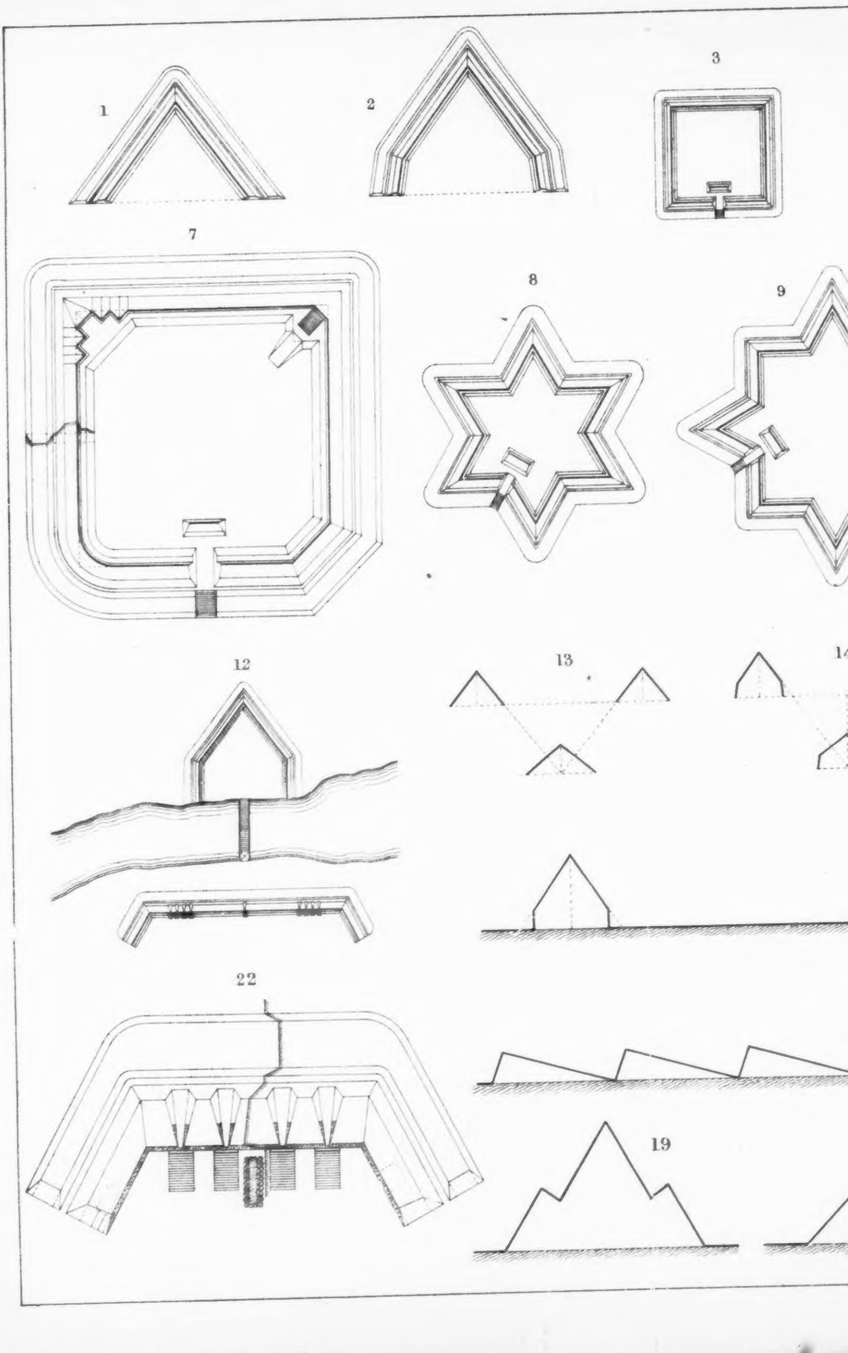
bridge, or to defend a ford. The length of its faces, and its angular formation, are of course dependent on the nature of the ground, the object in view in its construction, and the number of men available for its defence.

2. *The Lunette, or detached Bastion.* (*Figure* 2.)

This work, composed of two faces, and two flanks, is constructed for the same purposes as the redan, and is similarly open at the gorge. Its flanks, however, render it of more importance than the former work, and capable of a better defence, as it cannot so readily be turned, or taken in reverse. Moreover, the flanks of a line of lunettes mutually defend each other, flanking the intervals between them. To prevent a surprise in the night, a row of *chevaux-de-frise*, well secured with chains and clamp-irons, is generally placed in the gorges of lunettes and redans, or *trous-de-loup* may be dug. Works open at the gorge, unless they are but a short distance from the camp, or can be easily succoured and protected, are not capable of being well defended, as they can be so readily turned, and their troops taken in reverse. When, however, they are within such a distance that they can be seen by the army in their rear, the defenders fight with greater confidence than they would if inclosed on all sides; and, should the enemy succeed in capturing these works, they will be of little use, having no parapet or epaulement to cover their rear. Under all other circumstances inclosed works are preferable.

3. *Redoubts.* (*Figures* 3, 4, 5, 6, 7.)

A redoubt is a work enclosed on all sides, with the exception of the entrance to it. Redoubts are constructed either singly, to secure a post or communication, or continuously across the country, mutually defending each other if within distance, and retarding or preventing the advance of an enemy. Redoubts are of various forms; square, pentagonal, circular, hexagonal, and other figures; but their regular or irregular configurations are mainly dependent on the nature of the ground, and the object of their defence. The perimeter, or periphery, should be proportioned to the number of men intended to be posted within it; and the dimensions of the parapet must be such as to protect the defenders from the fire of artillery.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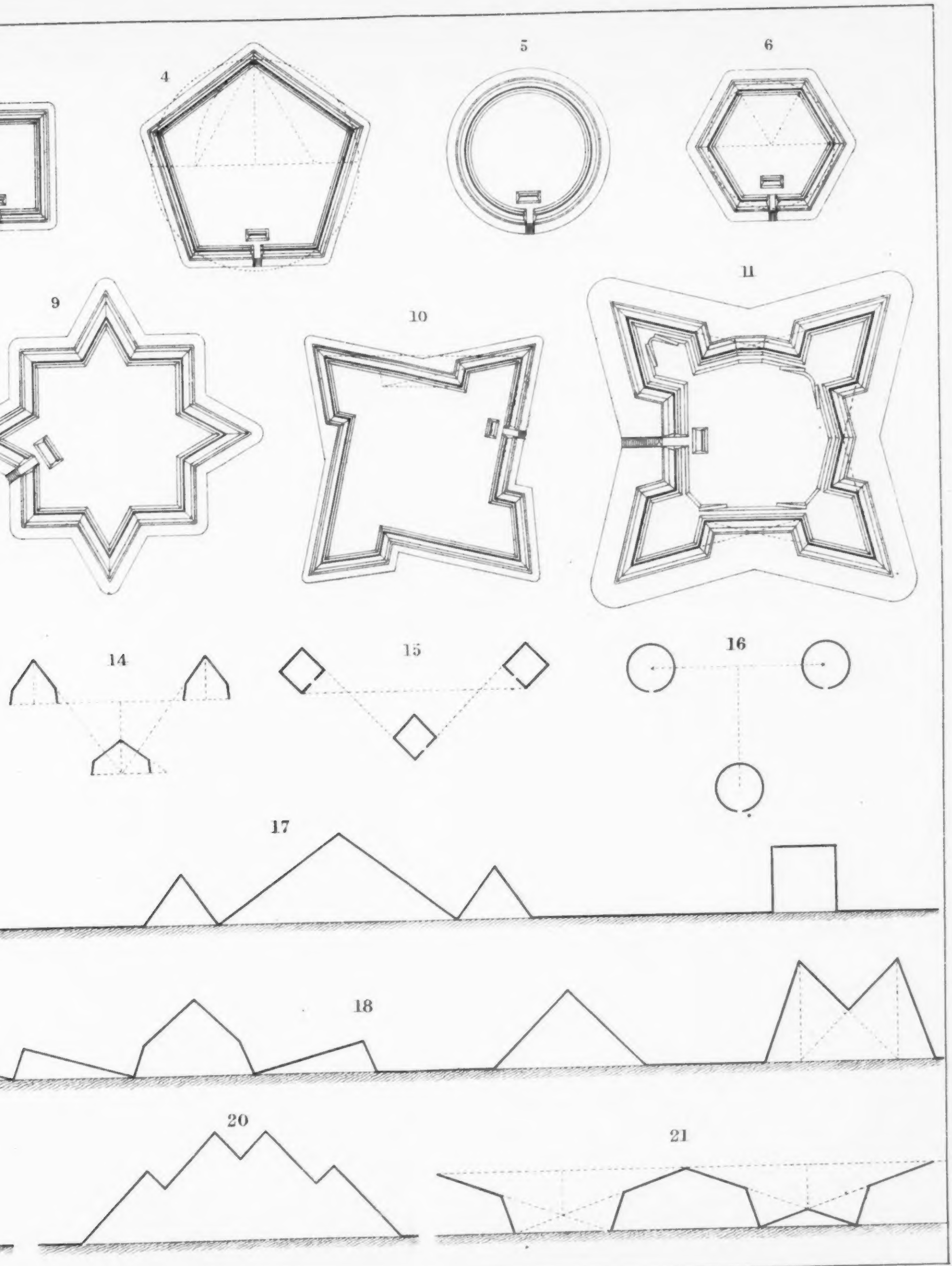


J.R.Jobbins

At the angles of redoubts, whether square, pentagonal, or hexagonal, there will necessarily be a considerable space that cannot be defended except by one man placed at the angle. This space is the sector of a circle, whose radii are the sides of the angle, having for their length the range of musketry fire. Thus the square has four spaces undefended, the pentagon five spaces, and the hexagon six spaces; there being as many spaces undefended as there are angles. It is worthy of observation, however, that the superficial extent of the several spaces undefended in a redoubt of any one form is similar to that of the several spaces not defended in a redoubt of any other regular formation; for in each instance the spaces without direct fire for their defence are equal to the sectors of a circle the radius of which is the range of musketry fire. Thus, as the whole undefended space around each work will be similar, with the difference only of being divided according to the number of its sides, it is evident that the approach to the redoubt will be more hazardous in proportion to the number of its faces. On this account a preference has often been given to the circular redoubt, the points of the circumference being equally under fire, and the soldiers, being posted equally around the centre, are able to vary their lines of fire every moment; and thus the enemy is nowhere in safety during his approach. The direction of the shot being, however, divergent, the effect will be inconsiderable at a short distance.

It is therefore evident, that when a bridge, a road, a pass, or any other place of small extent, is to be defended, a work with a straight front, parallel to the part under observation, should be selected in preference to a circular redoubt, whose fire on the point requiring defence cannot be as efficacious as that from the side of a rectangular work. In the construction of every description of field-work, the defective defence at the salient angles must be borne in mind, and these should, if possible, be covered by a marsh, or other obstacle; or in the absence of such safeguard the best marksmen should be posted in the angles for their defence. One mode of averting the angular evil is to form the parapet *en cremaillère*, the sides of these indentations being from 3 to 6 feet in length, alternately perpendicular and parallel to the diagonal of the work. Thus the angle is defended, and a more extended and cross fire

established. The redoubt *en cremaillère*, however, diminishes the strength of the parapet, is of difficult construction, and requires a firmer revetment than sods, which are considered the best and readiest revetment for field-works hastily thrown up, and is therefore not generally adopted.

As the parapet for field-works is considered well lined for defence when two infantry soldiers are told off to each yard of the interior perimeter, 5 or 6 yards being deducted for each piece of ordnance, it is clear that 200 men will be required for the musketry defence of a redoubt without ordnance, of 100 yards perimeter; and, when guns are mounted, the same calculation for the quota of men may be fairly adopted, as the number of artillerymen will about equal the strength required for the yards of parapet allotted to the guns. On some occasions two men may not be required to be told off for each yard of the perimeter, as the interior space is thereby much contracted. The interior perimeter of the crest of the parapet of a redoubt should never be less than 100 yards, or greater than 200 yards; if less than 100 yards, the men will be too much crowded together, and, if hand-grenades are used by the enemy, the effects will be disastrous to the defenders. When the number of men for a field-work requires a perimeter exceeding 200 yards, it is generally most advantageous to construct a work with flanks, the fire from the re-entering angles counterbalancing the defects of the salient angles.

I have thus given you the simplest rules for computing the number of men required for the defence of redoubts; for, after the perusal of many authors (English and French), who have made elaborate calculations on this subject, I find that the result of their many pages of observation and methods approximates closely to these simple rules.

For the protection of the passage into a redoubt, and of the bridge over the ditch, a traverse must be constructed, or, when the redoubt is large, a redan may be thrown up outside the work.

Star-forts. (*Figures* 8, 9.)

Star-forts are enclosed on all sides, are generally of considerable extent, and, being constructed with salient and re-entering angles, are capable of much greater defence than redoubts. These forts have

from four to eight points, or salient angles; the entrance to the works being at the re-entering angle least exposed, and covered by a traverse. The perimeter is dependent on the number of men to be stationed in it, and the service for which it is constructed; the dimensions of the parapet and ditch being similarly conformable to the object in view.

In the various authors who have written on the subject of field fortification, you will find different modes of constructing star-forts. At present I shall only bring under your notice the most simple, and possibly the best, manner of forming these works.

In every description of star-forts there is, as well as in the redoubt, a space in front of every salient angle which is undefended; and this space, though less than in the redoubt, is greater in proportion to the less number of points in the star-fort. As an exemplification of the adoption of star-forts, let me adduce the celebrated lines of Torres Vedras.

Forts with Bastions. (*Figures* 10, 11.)

These forts are constructed with half bastions, or with whole bastions, and are regular or irregular in their form, according to the ground on which they are required to be erected. They have sometimes a terreplein and interior slope, as well as a covertway and glacis, in addition to the ditch and parapet, and are constructed generally on a square or hexagon; but when applied to fortify an equilateral triangle the bastions are not, as usual, placed at the angles, but at the sides.

These works, especially the forts with whole bastions, approximate so closely to the works in permanent fortification, and are consequently so well flanked, that I need only add that these field-forts may be considered to be as near perfection as can be expected; as the principle in permanent fortification "that every part in the circumference of a work ought to be seen, and defended by some other part," though imperatively necessary in permanent works, may without serious detriment be dispensed with in field fortification.

Têtes-de-pont, or *Bridge-heads.* (*Figure* 12.)

Works constructed for the defence of a bridge are designated *Têtes-de-pont*, or *Bridge-heads.* Their form is dependent on the breadth of the river, the number of men required for their de-

fence, and the special object in view, whether to stop the advance of an invading army, or to delay victorious troops when in pursuit of the vanquished. Redans, lunettes, or a combination of these works, with long sides directed towards the river, two fronts of a whole or half bastioned fort, &c., may be advantageously employed in forming *têtes-de-pont*. When this work is intended to be permanent, a rampart and covertway are added to the parapet, &c. To prevent surprises by the gorge of the work, some impediment should be laid across the river above and below the bridge, which will prevent the passage of boats, &c. When the *tête-de-pont* has been constructed to cover a retreat, being in this case of considerable extent, an interior work should be formed within for the retreat of the troops who have defended the exterior parapet, and who may again retard or prevent the further advance of the enemy. As an additional defence of the bridge, an entrenchment should be thrown up on the opposite side, in the form best adapted to the intended objects, and the nature of the ground. Should the banks of the river be low and marshy, the *tête-de-pont* must be constructed at some distance from the shore, and in this case it must be an enclosed work, to prevent the possibility of its being taken in reverse.

Fortifying Camps, and Fields of Battle.

The ancients, especially the Romans, frequently fortified their camps, but seldom their fields of battle. This was peculiarly necessary in ancient times, to avert the surprises to which they were constantly exposed, in consequence of the proximity of their camps. A fortified camp has many advantages; it prevents desertions and surprises; by diminishing the strength of guards and pickets, it lessens the fatigues of the troops; it relieves a general from the necessity of being forced to engage the enemy under disadvantageous circumstances; and may serve as a rallying-place in the event of a defeat. But, notwithstanding these advantages, the practice of fortifying camps has been neglected, as it has been found that, while limiting and contracting the position and movements of the army thus entrenched, it gives full liberty to the enemy to make any dispositions he may consider best. Moreover, it manifests weakness and timidity, and experience proves that troops stationed behind

works have less firmness when attacked at close quarters than they have in the open field. Though the instances of forcing fortified camps and positions are very numerous, there are some in which a judicious selection of field-works has enabled an inferior number of men to withstand the repeated assaults of a very superior force, and even to obtain a victory. The redoubts raised in the front of the army of Peter the Great at Pultowa stopped the rapid and successful progress of Charles XII., and the magnificent lines of Torres Vedras baffled the French army, and secured our gallant though diminished number of troops against the attack of a far superior force. The works constructed to fortify a camp, or field of battle, consist either of detached, or continuous works. The former of which are either the redan, the lunette, or the square redoubt, having its angle directed towards the enemy; the latter or continuous works, called also lines of entrenchment, are generally composed of redans, lunettes, *queues d'hironde*, *cremaillères*, &c., united at suitable points by curtains, &c.

Detached Works. (*Figures* 13, 14, 15, 16.)

The distance between these works should be such that they may mutually defend each other by the fire of musketry. The saliency of the redan and lunette is very objectionable when considered with reference to the mutual defence of detached works. Square redoubts have the same faults as the redan and lunette even in a greater degree, occasioned by the angle being a right angle. An enemy may in many instances be deterred from attempting to pass the intermediate space between two redoubts; but, when once any of these works are taken, there will be great difficulty in dislodging the captors. Circular redoubts are constructed either in a single or a double chain; in the latter case the works of the rear chain are placed on a central line in the intermediate space between the advanced chain.

Continuous Works, or Lines of Entrenchment.
(*Figures* 17, 18, 19, 20, 21.)

The distance between the salients of the redans, &c. which are joined by curtains should be about 200 yards. Lines with bastions are preferable to the foregoing, being capable of much better defence, and the labour in their construction is amply repaid by the supe-

riority over the more simple form of work. The works which are constructed for the defence of a camp or field of battle, being exposed to cannon, musketry, and hand-to-hand combats, require not only parapets of much elevation and thickness, but the aid also of every available obstacle, such as palisades, *chevaux-de-frise*, abattis, *trous-de-loup*, &c. and the application of these impediments must be dependent on the situation of the works, and the degree of confidence with which the defenders are animated.

In the early portion of these lectures I brought under your notice the method of fortifying towns and positions from the earliest ages to the time when the Greeks and the Romans contended for the supremacy of the world. Let me now adduce a few more instances of the advantages derived from entrenchments, &c. commencing with extracts from the valuable pamphlet published by Colonel Hough, on "The Attack of Entrenchments," in which the erudite author has enumerated many cases of these attacks, to ascertain whether the assault in column or in line was most advantageous. The result of the examination is this—

Attacks by the British and other armies.—In line 3; in column 13. Entrenchments, being fortified works, ought to be attacked by the same rules which govern attacks upon other fortified places.

Schellenburg, 2 *July*, 1704.—Entrenchments of French and Bavarians attacked by the British and Dutch in four *lines.*

Along the front was an Entrenchment, which ran from the covert-way of Donawerth, was connected with an old fort on the brow of the hill above, and, embracing the summit, descended on the opposite flank to the very bank of the river. Of this work, the central part alone was in a state of defence, but the remainder was in a rapid progress of advancement. The assailants advanced with a firm and deliberate step, under a heavy fire from every point of the enemy's works commanding the line of approach. On reaching the ravine the foremost troops mistook it for the ditch of the entrenchment, and threw in their fascines, but, being unable to pass, and the fire of the enemy increasing in vivacity and effect, they began to give way. The Gallo-Bavarians took advantage of the confusion, rushed from their works, and charged the broken ranks with the bayonet; but they were repulsed, principally by a battalion of English guards.

The assailants continued to draw near the foot of the works, the English and Dutch were on the point of breaking into the entrenchments, when they were cheered by the advance of the Imperialists, led forward by the Margrave in person. Marlborough entered the works at the head of the first squadron; he recalled the foot, who were in pursuit of the fugitives, and ordered the horse to charge.

Battle of Bunker's Hill at Boston, 17 *June*, 1775.—About 9 o'clock in the evening of the 16th June, a strong detachment of Provincials moved from Cambridge, and, passing silently over Charlestown Neck, reached the top of Bunker's Hill unobserved. Having previously provided themselves with entrenching tools, they immediately set to work, and threw up an entrenchment, reaching from the river Mystic on the left to a redoubt on the right, both of which they had nearly completed by the morning, their works being in many places cannon-proof. The Provincials upon the hill, secure behind their entrenchment, reserved their fire for the near approach of the British troops, when a close and unremitting discharge of musketry took place, the Provincials in the works, as soon as they discharged their pieces, being furnished with others ready-loaded. So incessant and so destructive was this continued blaze of musketry, that the British line recoiled, and gave way in several parts. At this juncture General Clinton brought them back to the charge. The British soldiers, stung with the reflection of having given way before an enemy whom they despised, now returned with irresistible impetuosity, forced the entrenchments with fixed bayonets, and drove the Provincials from their works.

Referring to another valuable publication of Colonel Hough's, entitled, "Political and Military Events in India," it appears that at the battle of Dubba, March 24, 1843, two lines of the enemy's infantry were entrenched.

Battle of Ferozeshah, *Dec.* 21, 1845.—The soldiery had to face such a fire of musketry from the Sikh infantry, arranged behind the guns, that, in spite of their heroic efforts, a portion only of the entrenchment could be carried.

At the *battle of Sobraon*, *Feb.* 10, 1846, the Sikhs had gradually brought the greater part of their force into the entrenchment on the left bank of the Sutlej, which had been enlarged as impulse prompted,

or as opportunity offered; but the lines showed no trace of scientific skill, or of unity of design.

I must not quit the subject of earthworks without briefly alluding to the siege of Sebastopol; siege is, however, scarcely the proper term to apply, for more properly it was an attack on an intrenched position—field-work against field-work, mine and countermine, battery and counter-battery, sallies and repulses, heavy bombardment on both sides, hand-to-hand combats, and, finally, assault and capture.

And, in the notice of earthworks, can we forget the noble defence of Kars? Who does not admire the skill and indomitable perseverance of the commander (Sir William Williams), who directed the construction of works which defied and resisted the attacks of superior forces?

[*The lecturer then proceeded to an explanation of two plates, representing "the fascine battery," and the details of platforms, gabions, fascines, &c.*]

A knowledge of the construction of batteries being of vital importance to every soldier, it will be necessary for me to enter rather minutely into this portion of our subject.

Let me direct your attention to the construction of batteries, exemplified in figure 22.

There are three descriptions of field-batteries:—

1st. An elevated battery.

2nd. A half-sunken battery.

3rd. A sunken battery.

The elevated battery has its whole parapet raised above the natural surface of the ground, the earth being usually dug from a ditch in its front.

The half-sunken battery has its interior space sunk some inches below the surface of the ground, the parapet being composed of the earth thus obtained, and of earth from a narrow ditch in front.

The sunken battery has the whole of the earth required for the parapet taken from the interior space.

The half-sunken battery is constructed the quickest, as the diggers work both in front and rear of the parapet at the same time.

The following simple methods of tracing field-works on the ground will be found sufficiently accurate on most occasions.

1. *Square Redoubt.*—Place pickets in a line (in length conformable

to the side of the intended work), at each end of which erect perpendiculars equal in length to the side first marked out, and join the termination of these lines, which will complete the perimeter of the redoubt.

Note.—A perpendicular is raised on a given line, with a chain, or cord, by forming a right-angled triangle from the numbers 3, 4, and 5, or any multiples thereof, and extending the cord, &c. so that the base may correspond with the base line of the pickets, and the perpendicular be in the direction of the side required.

2. *Pentagonal Redoubt.*—With a chain, tape, or cord, construct and lay down with pickets five similar and contiguous triangles, having their bases, which form the sides of the pentagon, in the proportion of 47 to the other two equal sides, the length of each of these being 40.

3. *Hexagonal Redoubt.*—From a central point, with a chain or line construct and lay down with pickets six equilateral and contiguous triangles, the bases of which will form the required hexagon.

4. *Octagonal Redoubt.*—Construct a square (vide No. 1) from the centre of each side of which erect perpendiculars outwards, in length proportional to the side, as 13 to 60 (nearly 1 to 5), join the extremities or termination of the perpendiculars to the angles of the square, which will determine the sides of the octagon.

Note 1.—The directions for the construction of the pentagonal and hexagonal redoubts are on a small scale, but the redoubts may be increased by the equal extension of the interior sides of the triangles, until the bases are sufficiently long for the perimeter of the works required.

Under the head of Field Fortification the mode of rendering churches, houses, and other buildings capable of defence, is generally included.

Fortifying Houses, Churches, &c.—Experience has proved that churches and houses of masonry are capable of great defence, when due precautions are taken, as witness the heroic defence of Charles XII. when attacked by the Turks at Bender; and, at the battle of Waterloo, the noble defence of Hougomont.

Walls of brick are preferable to those of stone, as the shot perforates the former without much concussion, but a portion of the

latter is always demolished by the shot, and a few successive rounds make a practicable breach in the wall.

In the model now before you, which was constructed under my directions, the method of fortifying a house and the grounds around it is clearly shown, and by examining it you will far better appreciate the advantages attendant on the several operations than you will by merely hearing my description of them.

When the door is single, it should be barricaded on the inside with boards, tables, heavy furniture, &c. or should be bricked up, openings being left to fire through: these loop-holes are generally made 8 inches long and 3 inches wide. Should the door be large, it may be more advisable to throw it open, and stop up the passage with a tree or two, the branches being sharpened at the end. When there is a second door, the outer one should be closed up with trees, and the inner one be strengthened with boards, and have loop-holes cut in it. To prevent the enemy approaching close to the door, in order to cut through it with hatchets, or to blow it in with gunpowder, machicoulis of timber should be constructed, projecting from the roof, or from a window over the doorway. Holes should be perforated in the flooring of the machicoulis. The windows of the ground-floor should be closed up with brick, planks, carpets, &c. loop-holes being made through these and in the walls of the house, the ground-floor having two rows, and the upper floors one row. Scaffolds or banquettes will be required for the men to fire through the loop-holes. Should the defenders not be strong enough to man the first-floor, the windows may be blocked up entirely, and it will be advisable to take the same precautions for the other floors when the detachment is very weak. Every exertion should be made to prevent the enemy undermining the wall. In buildings in the form of a cross, such as churches, &c. the advantage of cross-fire is obtained by opening loop-holes in the walls. Should the enemy succeed in forcing an entrance into the lower part of the building, the defenders must retire to the upper floor, where resistance may still be carried on by breaking up or stopping up the staircase; opening the floor in different parts, and firing down through the apertures on the enemy. The openings should be made in such a manner as to enable the defenders to have a full view of the basement, that mea-

sures may be promptly taken to prevent every attempt to kindle a fire. If the roof of the house is covered with tiles or slates, they must be removed, to prevent the enemy breaking an opening, should the walls be escaladed. Moreover, communication with all parts of the upper rooms of the floors above will be thus secured, and the enemy's operations outside will be well watched. When the roof is within the walls, and a passage thus between them, the slates and tiles need not be removed, as the wall will form a parapet for the cover of the men and enable them also to avert escalade, by firing on the enemy, hurling down stones, bricks, and throwing down the ladders. To prevent fire, the evil most to be dreaded in the defence of the building, tubs filled with water should be in readiness in every story; all furniture should be removed, the floors covered with sand or earth 5 or 6 inches deep, and the windows blocked up to prevent the enemy setting fire to the house by throwing in hand-grenades, burning faggots, &c. To increase the defence, a parapet and ditch may be constructed around the parts of the building open to attack, a small opening being left in the wall of the house for the defenders of the parapet to retire through. An abattis, either with or without a breastwork, should be laid down to embarrass the enemy in his advance.

Churchyards and gardens require but little art to render them capable of good defence. The doors and gates must be blockaded, a ditch be dug in front of the enclosure, the walls loopholed, banquettes constructed when necessary, and sandbags, &c. should be in readiness to be placed on the wall at the points required. Abattis, *trous-de-loup*, and other obstacles, are to be made use of to impede the enemy's advance. When the churchyard is enclosed with open pales or palisades, a parapet and ditch should be constructed within, at about five yards distance from the palings: the height of the parapet and the depth of the ditch being sufficient for the protection of the defenders. Gardens, similarly to churchyards, are capable of strong defence, and are to be fortified in the same manner; the walls if high will require scaffolding to form an upper banquette, a quick-set enclosure will require a ditch and parapet to be constructed within it, the hedge being cut so as to enable the men to fire effectively through it.

To prevent the enemy obtaining any shelter or cover, the build-

ings within range of musketry fire (if not intended to be occupied for the defence) should be demolished, especially any that may overlook; for, should the assailants take possession of houses that command the position, the post will soon be rendered untenable by the fire of musketry from upper windows. The defence of churchyards and gardens, which are not commanded by any height or buildings, may be of great importance, for their inclosures may be considered as the outwork, and any buildings within as the body, of the place. When commanded, however, the defence can be but of short duration, and may probably be at a great sacrifice of life.

In fortifying churches and churchyards, houses, and gardens, the chief objects of attention will be—

1st. To render the approach or access as difficult as possible, not only should the measures previously mentioned be adopted, but the roads, avenues, &c. leading to the post should be broken up, or be encumbered with trees, harrows, rubbish, &c.; deep trenches should be cut, *trous-de-loup* made; in short, the passage should be obstructed by every possible appliance of defensive skill. These obstacles, to be thoroughly advantageous, should however be within the range of musketry fire from the buildings.

2nd. Further to strengthen the position, preparations should be made for a cross-fire, loop-holes being made in the several projections of the buildings. Recourse should also be had to machicoulis and tambours; even earthworks, such as redans and lunettes, should be constructed.

Fortifying villages, or small towns.

Villages in the vicinity of a camp are fortified to keep the pickets and advanced guards of the enemy at a distance; and on the day of battle a village judiciously fortified will materially strengthen a wing, or corps, and facilitate and conceal the movements of the army. When in the vicinity of a camp, the side of the village towards the enemy should be fortified with earthworks, raised at some distance from the houses, which works may either be detached or continuous.

Earth banked up against the walls, palings, &c. around the village will materially add to the defences of the entrenchment. The chief objects of attention in fortifying villages, &c. are—

1st. To make the different parts reciprocally flank and defend each other, securing the extremities, to prevent the works being turned.

2nd. In order that the enemy may be seen, and exposed to the fire of the defenders, every object that interposes and conceals his movements should be levelled; hedges, thickets, and even single trees should be cut down, and every obstruction should be raised to impede his approach; and, to prevent his advancing with an extended front, deep trenches should be dug, and *trous-de-loup* should be formed. The side of the village nearest to the camp should be left open, to prevent its being of service to the enemy in case of capture. The communications between the camp and the village must be kept as free as possible, to support the defenders when attacked, or to dislodge the enemy should he obtain possession. If there is not sufficient time to throw up an entrenchment, houses of brick or stone nearest the enemy should be put in a state of defence, especially where roads meet, and the intervals between these houses should be strengthened with abattis, &c.; the church, and church-yard, and any large buildings, should also be fortified.

Considering the advantages that may be derived from the resolute defence of a single house, immense resistance may be expected from the defence of a well-fortified village, the houses of which have not only direct defences, but by their disposition are able to flank each other.

The roads and all the approaches should be rendered impassable, or be seriously encumbered by ditches, abattis, &c. Soldiers should be posted behind hedges, palings, and stone walls, to impede by their fire the advance of the enemy; the more obstacles than can be opposed to the assailants, the greater hope will there be of maintaining the post, and the more honour will there be to the gallant defenders.

I must now bring my brief, but I trust sufficiently explanatory, exposition of field fortification to a close. Let me, however, mention that these lectures are only to be considered as an epitome of the operations to be carried on in the construction and in the attack and defence of field-works. To attain eminence in the military profession, practice *alone* will not suffice; the theory of fortification, tactics, &c. must be well studied, not only in publications in our own language, but also in those of other nations. The different systems of attack and defence should be compared together, and profit be gained by the experience of our predecessors in warfare.

Wednesday, June 9th.

Vice-Admiral Sir THOMAS HERBERT, K.C.B. in the Chair.

ON LOWERING BOATS AT SEA.

By Wm. Stirling Lacon, Esq.

The subject of "Lowering Boats at Sea" is one of great importance. Some years ago I brought it before the public, and, in the shape of a Lecture, before the Members of this Institution. At that time I laboured under a double disadvantage, first, because I was an inventor, a species of animal that is generally looked upon, not always with reason, as a great bore; and, secondly, because, although advocating a subject so interesting as that of the "saving of human life," I could not at that time divest myself of the feeling that I might be considered as having a personal, perhaps a selfish, interest in the matter. Having in the meantime waived any plan of my own on the appearance of another and a cheaper one, I trust you will bear with me while I endeavour to explain to you what that other plan is, and that any deficiency on my part will be forgiven, in consideration of the vast importance of the subject.

Mr. Clifford's system has now been several years before the public, and yet there are naval men, who have since commanded ships, who have never seen or heard of it. I feel, therefore, that no apology is due to naval men for thus presenting myself before them; and to any non-naval persons who I may now have the honour of addressing I would observe, that the subject is of equal interest and importance to them; for, in these days of locomotion, who can tell when they may be called upon to be actors in a scene, when the knowledge that a safe and ready method is at hand may stand them in good service, and when, by their presence of mind and good example to others, they may save "that rushing to the boats," which has in so many instances caused such a fearful expenditure of human life?

I purpose therefore to explain to you:

1st. The dangers attendant upon the old system of lowering boats by the tackles;

2ndly. What was required to obviate these dangers; and,

3rdly. The very admirable method by which Mr. Clifford has worked out the problem.

In order that you may more clearly understand the "dangers" of the old system, it would perhaps be advisable that I should read to you a statement of some facts, and also some extracts of evidence that has at various times been taken on the subject:

On Saturday the 20th of November, 1804, the English fleet under the command of Admiral the Honourable W. Cornwallis lay at anchor in Torbay. As it was late in the year, and the night dark and stormy, orders were given for the fleet to put to sea. Unfortunately, in fishing the anchor of the "Venerable," 74 guns, the fish-hook gave way, and a man was precipitated into the sea. The alarm was immediately given, and one of the cutters was ordered to be lowered. Numbers of the crew rushed aft to carry the orders into effect; but, in the confusion, one of the falls was suddenly let go—the boat fell by the run, filled, and a midshipman and two of the men were drowned. In a few minutes another boat was lowered, which fortunately succeeded in picking up the man who first fell overboard. Owing to this delay, the "Venerable" fell off considerably towards Brixham, and, getting sternway, was unable to weather the Berry Head. Every effort was made to stay her, but the ship refused; and, not having room to wear, she drove on shore at the north part of the Bay, on a spot called Roundem Head, near Paignton. In sixteen hours from the time she first struck, the whole vessel had disappeared under the action of the raging surf, lashed into fury by the violence of the gale. The crew consisted of 590, of whom a few were drowned.

From the loss of the "Kent," by fire, in the Bay of Biscay, on the 1st of March, 1825, when eighty-one individuals perished, an account of which was published by the Religious Tract Society, I have selected the following extract:

Although Captain Cobb had used every precaution to diminish the danger of the boat's descent, by stationing a man with an axe to cut away the tackle from either extremity, should the slightest difficulty occur in unhooking it, yet the peril attending the whole operation, which can only be estimated by nautical men, had very nearly proved fatal to its numerous inmates. After one or two unsuccessful attempts to place the little frail bark fairly upon the surface of the water, the command was given to unhook. The tackle at the stern was in consequence immediately cleared; but, the ropes at the bow having got foul, the sailor there found it impossible to obey the order. In vain was the axe applied to the entangled tackle; the moment was inconceivably critical, as the boat, which necessarily followed the motion of the ship, was gradually rising out of the water, and must in another instant have been hanging perpendicularly by the bow, and its helpless passengers launched into the deep, had not a most providential wave suddenly struck and lifted up the stem so as to enable the seaman to release the

tackle. The boat, being thus dexterously cleared from the ship, was seen after a while from the poop battling with the billows.

At midnight on the 7th of April, 1843, the "Solway," when about twenty miles west of Corunna, struck upon a rock. She was backed off, and in twenty-five minutes afterwards she sank while making for the shore. Whilst proceeding towards the land, a general rush was made to the pinnace, which hung at the davits on the starboard side; twenty-five persons got into her, and having seated themselves, cried out to those on board to lower away. Captain Duncan, who evidently foresaw the great danger of lowering a boat at full speed, endeavoured to prevent this; but the confusion was so great on board, and his own attention so entirely devoted to the great object of getting the paddle-box lifeboats afloat and making the shore, that his opposition was of no avail, and the forward tackle was let fly by the run, and the bows of the boat dropped into the water. The situation of the poor wretches who had made this their hope of escape was now perilous in the extreme. A cry of "For God's sake, let go the after tackle!" was answered by some of the crew as soon as possible, and the pinnace fell into the water. The ship had still full speed upon her, and now a heavy sea striking the boat, as she floated for an instant, swept every soul into the ocean.

The "Avenger," a steam-frigate, Captain Charles Napier, with an armament of six heavy guns, and a crew of 250 men, sailed from Gibraltar on the 17th of December, 1847. At 9 p.m., on the 20th of December, while running with square yards at the rate of eight or nine knots, she struck upon the Sorelli. The officers in the gun-room were upon the point of retiring to their berths, when they were startled by a sudden jerk; the ship gave a heavy lurch, as if filling, and her whole frame appeared shaken and every beam loosened. The captain then gave the order "out boats;" these were his last words, for he was immediately afterwards washed overboard and drowned. Whilst they were in the act of lowering the cutter, an accident occurred which was nearly proving fatal to all their hopes of preservation; in lowering the boat the foremost fall got jambed, and, the after one going freely, the boat had her stern in the water and her bows in the air. At this moment Dr. Steel threw in his cloak, which fortunately got into the sheave-hole of the after fall and stopped it. Just as the boat touched the water, and before the tackles were unhooked, the ship again struck heavily, and began swinging broadside to the sea, falling over to starboard at the same time, which, from the cutter being the port one, made her crash with great violence against the ship's side. However, by dint of great exertion, the boat was got clear from the tackles and pulled clear from the ship. Of a crew of 250, 246 were drowned.

In the case of the "Amazon," one of the survivors, as reported in the "Times" newspaper, states:

The mail-boat when lowered was immediately swamped, with about twenty-five people in her, all of whom were lost. The pinnace when lowered sheered across the sea before the people in her could unhook the fore tackle (fig. 5); they were thereby washed out, and the boat remained hanging by the bow. While clearing away the second cutter, a sea struck her and raised her off the cranes and unhooked the bow tackle (fig. 6); the fore end immediately fell down, and the people in her (with the exception of two, who hung doubled over the thwarts,) were precipitated into the sea.

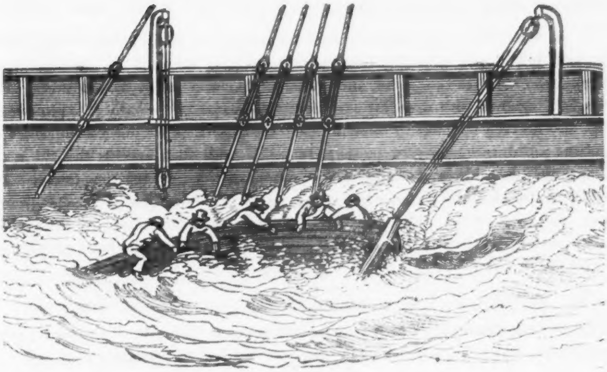


Fig. 5.

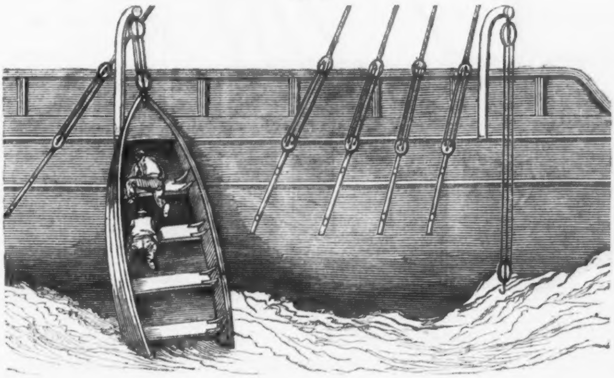


Fig. 6.

Lieut. Grylls, R.N., stated:

The first boat attempted to be lowered was on the port quarter; Lieut. Grylls was himself lowering the after fall, when Captain Symons seized him by the arm and besought him to desist, as he said everybody would be drowned. Lieut. Grylls then called out to the person by the foremost fall, imploring him not to lower, as the ship was going so fast. The person at the foremost fall, by constant and urgent request of the people in the boat, let the fall go, by which means the boat turned over, and, as nearly as could be seen, every one was washed out of her. Seeing this at the moment, Lieut. Grylls attempted to let go the after fall so as to save them, but, the fall being jambed and having fouled, and the boat thus not being clear, her stem hung in the air for the moment until cut adrift by some one, when she turned over, and, seeing the people washed away, Lieut. Grylls turned aside from the appalling sight in horror.

Mr. Neilson, a survivor, states,—

In the meantime the aftermost boat on the port side (I think the mail boat) was lowered down, with probably twenty-five people in her, but the moment she touched the water she swamped, and all hands that were in her drifted astern, all clinging together with dreadful shrieks. The next boat forward (the pinnace) was also lowered full, but by some accident the after tackle alone got unhooked, and she was dragged forward by the fore tackle with such rapidity that the sea swept round her sides and washed every soul out of her. At this time the second cutter had reached the water, when a sea struck the bow, and as the ship rose from the swell of the waves she lifted the boat perpendicularly by the stern tackle, and discharged all the unfortunate inmates but two, who hung shrieking across the thwarts.

Mr. Kilkelly, an Irish gentleman,—

Proceeding immediately to the deck, and going to the side of the vessel, got into a boat, which slided down edgeways, and thus lost all her oars.

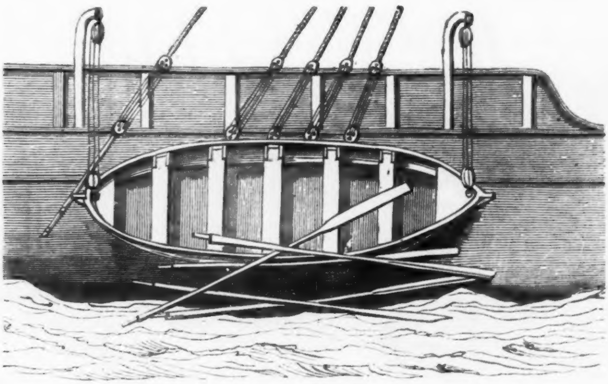


Fig. 7.

William Angus, the second engineer,—

In attempting to lower another boat on the starboard side (the first cutter), the stern fall was let go too quickly, and on dipping into the water the boat was drawn to the side of the ship, and the people thrown into the sea.

Isaac Roberts, boilermaker,—

In lowering her down unfortunately let go the fore tackle, and threw the people, about eighteen or twenty, crew and passengers, into the water.

Michael Fox, fireman,—

Went forward and sung out to a man to clear away the tackle fall, and pass the end into the boat. Through want of skill, or some other cause, instead of giving the end, the man let go altogether, and precipitated the bow of the boat

into the water. In the boat were a great many persons, nearly all of whom were thrown out.

George Webb, able seaman, says,—

Some one let go the bow tackle, and the boat filled. A great many people fell overboard. The chief officer and several others were clearing away the aftermost life-boat. Webb jumped into the stern of her, and got hold of the tackle and lowered her down. Some one else lowered the bow. Before the boat touched the water the after tackle fouled, Webb took out his knife and cut it.

Henry Wright, of Gosport, seaman, says,—

When in the boat, preventing her from being swamped, by trying to clear the fore tackle fall, the block caught his left hand, and took off the tops of his two middle fingers, and smashed his little finger.

Alexander Lang, quartermaster,—

Went to the wheel, but it was fouled by the tackle-fall of the dingy.

George Harding states,—

The tackle fall of the dingy had entangled the rudder.

In the evidence taken on the trial of the officers of the "Orion," lost on the West Coast of Scotland, before the High Court of Justiciary at Edinburgh, D. Walker, seaman, says,—

While lowering the starboard quarter-boat the bows were down in the water, while the other end hung by the tackle, and one or two tumbled out of her; and while the port life-boat was being lowered there were one or two tumbled out of her.

And Robert Wilson, the Clyde pilot, speaking of the larboard life-boat, says,—

"I could not lower the tackle on account of the weight in her."

In the wreck of the "Conqueror," near Boulogne, on the 13th of January, 1842,—

The ladies, children, and servants were handed into the cutter: the water was not a couple of yards off her bottom, but the falls of the tackle had got so entangled with the rest of the cordage upon the poop, that they were not able to lower them. The captain cut the boat from the davits.

The last instance to which I wish to draw your attention is a most melancholy one, and may perhaps be in the recollection of many now present. It occurred on the return of the "Melville" flag-ship from the East Indies, when the gallant son of the admiral was drowned, in his attempt to save the life of a man who had fallen overboard. The circumstance is narrated in a letter, which I am now about to read to you, from Captain A. S. Hammond, R.N. to Lieutenant-Colonel, now General, Willes, R.M. both on board the ship at the time, the one as lieutenant, the other in command of the marines.

On the occasion of Sir John Gore's son being drowned off the Cape of Good Hope on the 30th of April, 1835, the "Melville," seventy-four guns, on board of which ship the admiral's flag was flying, was lying to, under a main topsail. The courses were being hauled up and topsails lowered on the cap, with yards braced in and secured. A man having fallen overboard from the weather fore-yard arm, Lieut. John Gore, the flag-lieutenant, jumped overboard to save him from the weather quarter boat; and soon afterwards the lee quarter boat was cleared away and lowered, with Lieut. Fitzgerald and ten men in her, at which operation I attended. But in spite of every attention, from the heavy lurching of the ship, and her rolling to windward, a considerable quantity of water was shipped by her; and I am also of opinion the boat was shaken by the blows which she received in striking against the ship's side whilst in the act of lowering.

In consequence of this impression I spoke to the Captain (the present Rear-Admiral Sir Henry Hart, K.C.H.), and asked him if I might be allowed to take the weather quarter cutter, in case of any disaster having happened to the other boat; to which request, after some consideration, he gave his consent, and I jumped into her, quickly followed by numerous volunteers, and a young middy of the name of Heath.

Any amelioration of the old established plan of lowering boats would, in this instance, have been of infinite service; for I have never witnessed a worse occasion for lowering a boat during my experience at sea. From the weight of the men in her, and the constant lurching of the ship, we were nearly thrown out of the boat frequently, and I thought she would have been stove in from striking against the muzzles of the main deck guns; and, before we could get the tackles unhooked, the indraught took us under the counter, and we had the nearest escape possible from being swamped by it. Fortunately we managed to get clear of the ship without mishap, and proceeded on our search, which proved, alas! a most fruitless one, as all hands were lost except ourselves.

Don't you recollect (continues the writer) when a man fell overboard from us, just after leaving the Sand Heads, and a quarter boat was lowered, with, I think, Crawfurd in her, and the boat's crew, and something happened to the boat's tackle falls in lowering, and the whole of the men were thrown into the water, and they also went astern, together with the swamped boat, oars, bottom boards, &c. floating about? Fortunately no lives were lost, but there might have been.

It would be easy to multiply instances, but the above will suffice to show the dangers attendant upon lowering boats by the tackles. In so doing it requires two men in the boat (one at each fall to unhook), and, on board the ship, two men to lower, and two men to clear the falls—no easy matter where the falls are little used, and where, as in the case of the largest merchant steamers, each fall is 22 fathoms, or 132 feet long.* Under any circumstances it requires the greatest unanimity of action on the part of these six men; but how is this to be ensured during periods of excitement and danger,

* The davits of the "Princess Royal" are 45 feet from the water, consequently the falls must be five or six times that length, or at least from 230 to 270 feet long.

and during dark nights? If one of the falls should be lowered too quickly—if one of them should foul or be accidentally let go—then, one end of the boat having reached the water before the other, it is impossible for the men in the boat to unhook at the same time, and an accident must inevitably happen. Or, supposing that all has gone right on board the ship, and that before the boat has reached the water a sea should lift the stern of the boat and unhook the after-tackle, then (as seen in the above instances) the boat would sheer across the sea before the people in her could unhook the fore-tackle, and they would thereby be washed out, and the boat would remain hanging by the bow; or if in the act of lowering a sea should strike the bow and unhook the fore-tackle, then the fore end would immediately fall down, and the people would be precipitated into the sea, and drowned.

Not only is the operation of lowering boats attended with so much difficulty and danger, but it is an extraordinary fact, that it is in direct opposition to any mechanical operation of the like character. It is an acknowledged principle of mechanics, that to raise a weight requires a power; but what is gained in power is lost in time. We see it in the every-day operations of raising a weight, that, when the weight has attained the requisite elevation, the power is disconnected, and a break or other analogous contrivance is substituted, in order to regulate the descent.

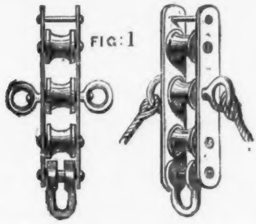
Why, therefore, should not the same plan be adopted in the case of weights (*i. e.* boats) which remain for a lengthened period at the requisite elevation, and which are only required on sudden emergencies? Sailors, themselves, acknowledge the principle, and carry it into effect, as in the case of the anchor.

When the anchor has been elevated by means of the chain to the level of the water, a tackle called the "cat" is used to raise it to the level of the deck; this is the power, and sailors know very well that, if they were to allow the same to remain, the anchor could never be used on sudden emergencies; they, therefore, substitute a single rope (called the cat-head stopper) and remove the tackle. They remove the one tackle from the anchor; why, therefore, should they not remove the two tackles from the boats, which it has been shown in their use require the greatest unanimity of action?

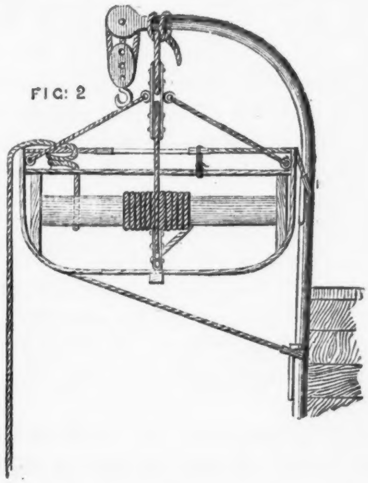
Many captains of ships have acknowledged the principle even in the case of the boats, for they have unhooked the tackles, and substituted single ropes or pennants; but in so doing they have aggravated the disease, without substituting a remedy: for, it must be apparent to every one, that if, in lowering with the "tackles," there was danger in "a heavy boat going down by the run," that danger must be considerably enhanced where the weight has to be balanced and controlled by a single rope. This was the difficulty to be overcome; and it is the very ingenious method by which Mr. Clifford has succeeded in doing so, that I now purpose to explain to you.

Before proceeding, however, it would be as well that I should say a few words on the subject of "hoisting boats;" for, in the numerous schemes which of late years have appeared before the public, inventors and others have confounded the two operations. The hoisting a boat in a heavy sea is quite as ticklish an operation as that of lowering a boat; and I believe I have the authority of all naval men for propounding the maxim from this place, that no mechanical operation for "hoisting" a boat can ever supersede the use of the tackles. When a boat is to be hoisted up the whole strength of the crew is generally made available—one half of the crew manning one of the falls, the other half the other. The boatswain stands on the hammock nettings, and two men are in the boat to hook on the tackles. Either fall is "gathered in upon" or "slacked up" as circumstances may require, until the boatswain, having watched the appropriate moment, "pipes," the falls are "married," "the men run away with it," and the boat "is up."

It is only when the boat is hoisted up, that Mr. Clifford's system is brought into operation, and the great merit of it appears to me to consist in this, that while he removes the power (*i. e.* the tackles) he substitutes another power, which, with all the rapidity of lowering with a single rope, enables him by means of one man fully to regulate and control the descent of the boat. He brings a single rope or pennant, the standing part of which is made fast to the end of the davit, through a block of peculiar construction (fig. 1), the rope passing on alternate sides of the three sheaves, which are arranged one over the other; the rope is then carried through a leading-block attached firmly to the keel of the boat (fig. 2), and, the end



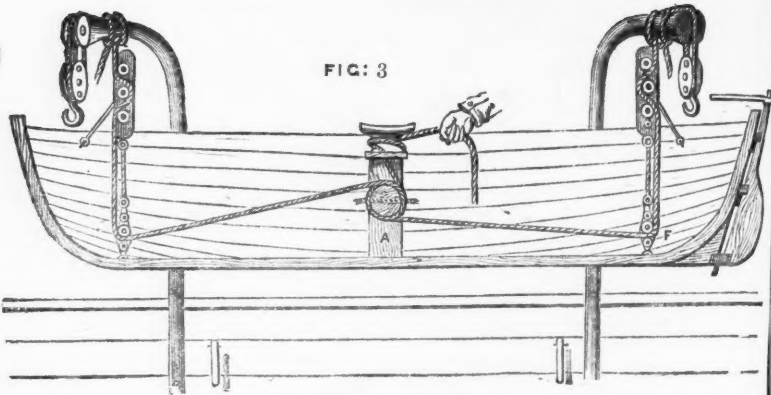
being inserted in a roller underneath one of the thwarts, the roller, by means of a smaller rope which had been previously wound round it, is made to revolve, till the whole of the slack pennant is exhausted.



The other pennant is treated simultaneously in the same manner, so that, when both are quite taut and the tackles are removed, the boat is secured, as shown at fig. 3.*

* In all cases the boat's tackles should be hooked to an eye-bolt in the davit end, and, when the boat has been secured by Mr. Clifford's system, they should be unhooked and stowed away down below, thus effecting great economy in wear and tear, from so much rope being constantly exposed to sun and rain, besides disencumbering the decks of two large coils for each boat.

The boat being now secured, hangs by two single ropes or pennants (the



In lowering, one man takes the small rope in his hand, which, as he slackens, winds on to the roller as the pennants in the act of lowering unroll; he is enabled thereby to control the descent whatever the weight may be, and however crowded with people; for, not only has he the greatest control over the revolutions of the roller, but the resisting strain is considerably modified by the ropes passing over the sheaves of the block (the nip of the block being in proportion to the weight of the boat and the consequent strain upon the pennants), and, when the boat reaches the water, by letting go the small rope altogether the roller is free to revolve, and the ends of the pennants, not being secured, detach themselves, unreeve, and the boat is clear of the ship.

The block, fig. 1, being attached to the sides of the boat by steadying-lines, and the block itself being the point of suspense at which the boat hangs, as shown in fig. 2, canting is effectually prevented.

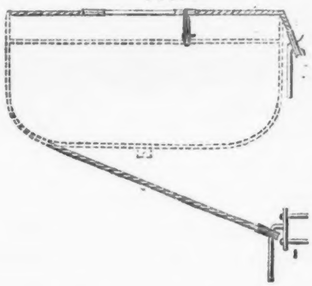
An objection has been raised that the pennants, being fitted for smooth water or for a ship on an even keel, if a ship were rolling in a heavy sea, the pennants might unreeve and detach themselves

weakest point of Mr. Clifford's system), for either a constant freshening of the nip would be required, or some other additional security; but this might be obviated by a stopper at each davit (similar to the cat-head stopper), which would take the strain off the pennants, and, being easily let go or cast off, would not interfere with the sudden and instantaneous lowering of the boat.

before the boat reaches the water, and, consequently, that the boat might fall into the water from a considerable height; but, to obviate this, it would only be necessary to take care that the pennants are fitted too long instead of too short, because, whatever their length may be, when the boat has reached the water, the roller in the boat being free to revolve, they will unreeve of their own accord as the boat drags away from the ship.

Another improvement introduced by Mr. Clifford is, that the gripes or lashings by which the boat is secured to the ship are made self-releasing. A prong is attached to the ship's side, as at fig. 4, a

FIG: 4



thimble at one end of the gripe is passed up this, and the lanyard at the other end hauled taut. In lowering there is no necessity to "cast off the gripes," for the thimbles slip down the prongs, and the boat is free.

There is one other subject which, as I am lecturing on the subject of boats, I trust I may be pardoned if I briefly allude to, and that is to the "covering of boats;" for all persons who have witnessed the action of a tropical sun must know, that, to ensure a boat's being at all times serviceable, she must be protected from the rays of the sun. In the navy, I believe, it is the custom to wet the boats every morning and evening, to cover them during the day, and to uncover them at night In many ships which leave our ports we know that very little attention is given to the matter.* A common practice is

* In illustration of this I may mention that about five years ago I was casually lounging through the Docks at Liverpool. Conversing with one of the sailors

to cover the boat over all, and to lace the cover underneath. This not only prevents a man getting into the boat, but, as the boat is hanging from the davits, the lacing in such case is difficult to get at; but if the cover is put round the boat and laced

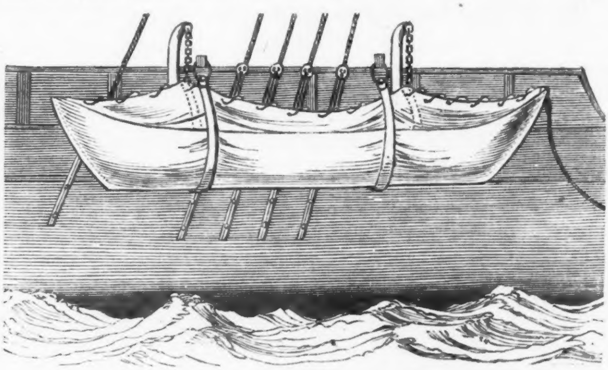


Fig. 8.

above, then not only can a man get into the boat, and from that position let go the lacing, but, in cases of sudden emergency, the cover thus secured might be lowered with the boat, and if the lacing be cut, even when the boat is in the water, the weight of the wet cover would cause it to sink clear of her.

In the evidence taken on the trial of the officers of the "Orion," Captain John Boyd, formerly commanding the Admiral steamer, stated,—

The covers on the boats are laced underneath.

David Croall, the carpenter of the "Orion," stated,—

The "Orion's" boats had covers from the first, and laced under the keel.

John Stewart, seaman, stated,—

It took us ten minutes before we could get the covers off the boats.

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belonging to one of the numerous steam-ships, I pointed out to him the improper manner in which the boats were secured, and cautioned him, that inattention to apparently such small particulars might one day cost many lives. Within six months that day did come, and those boats were useless. In the evidence that was afterwards taken on the subject, it was proved that they were carried down with the ship when she sank, and were not disengaged from her till sixteen hours after the accident. Many lives were lost.

Friday, June 11th, 1858.

General Sir JOHN BURGOYNE, Bart., R.E. G.C.B., in the Chair.

THE MILITIA, AND ITS DEFENSIVE USES IN THE EVENT OF INVASION.

By Col. ADAIR, Suffolk Artillery, A.D.C. to the Queen.

I SHOULD ill discharge the duty I owe to the Council, by whose permission I address you, if I permitted any erroneous inferences to be drawn from silence on the general application of the system I recommend. Be it clearly understood that the organisation of this ancient constitutional force is discussed without regard to any passing event; that it has no occasional reference to assumed schemes of dynastic or of national ambition; that the object to be considered is the most serviceable development of the militia system for internal defence, while we do not exclude from our observation this remarkable fact, that if Central and Western Europe should again, unhappily, be scourged by war, it is a prevalent opinion elsewhere, that the invasion of England would be one of the probable military incidents of the struggle, a consummation which we are bound in duty to our country and to the world to put forth every resource to prevent.

It is, then, proposed to trace the organisation of the militia army from the constitution of the single regiment into the combination of regiments into brigades and divisions; to develop its capacity for defensive purposes; and to show how, by careful and continuous preparation, this army of reserve is competent to maintain an effective defence, *en première ligne*, against a far larger mass of invading power than has yet been proposed or suggested. And in this analysis and series of suggestions the elements of calculation will be drawn from the recognised properties of the militia army, without reference to the advantages derivable from the spirit of the people, and from circumstances of ground. It is intended to resolve the question into a ponderation of military dynamics.

The general rule of the militia service is, that the officers as well as the volunteers should be taken from the district in which the

regiment is raised. The distribution of the regiment is local; the primary system of defence should therefore, in the event of invasion, be special and local also. For, as an invasion must always partake of the nature of a surprise, it is an unnecessary, and probably perilous, anticipation of an enemy's plan of campaign to distribute the forces of resistance on certain points arbitrarily assumed, and endowed with an importance which they may not deserve. It was this error that Napoleon punished so severely by masking important fortresses in his German campaigns: and it is a fault that is least pardonable on the part of a tactician who possesses the permanent advantage of projecting defensive movements from the centre to the circumference, and consequently on interior lines of operation. It follows, then, that, to guard against surprise, the normal position of the army of reserve, pending a decisive movement on the part of the invader, should be within the district to which each regiment, brigade, or division belongs. But if such be the law of primary organization, and if it appear probable that the services of any one regiment, brigade, or division should be available first within such district, then, in order to a more complete efficiency, each should be specially trained, regard being had to the natural capabilities and features of the district.

The regiment being considered as a corps intended to act first in a particular locality, the instruction suitable to the special arm of the service should be directed to that end. For this is evident, that the essential and primary duty of militia regiments is, on invasion, to fight battles of position, on ground previously selected, and to which the troops should be accustomed, in order to gain time for the General commanding the central army of manœuvre, with its reserves, to prepare those strategic combinations from which important movements originate and by which battles are decided.

Now this training will necessarily be governed by the nature of the arm to which the regiment belongs, as well as by the features of the country. For instance, since the great war of 1815, a portion of the militia has been formed into regiments of artillery, raised in the maritime counties of the United Kingdom. The position and duties of these regiments designate them as the corps intended to remain on the watch, and to be prepared to fight the battles of posi-

tion to which the tactics of invasion naturally determine, and which the genius of the nation specially affects. To illustrate the mode of defence which might be adopted in the maritime counties, let the district from which the Suffolk regiment of artillery is raised be topographically examined. Lying between Ipswich and Great Yarmouth, it rises towards the interior into a clay plateau, from which streams flow into the German Ocean, dividing the region into eight fluvial districts. As the inclination of the ground is gentle, it is easy to dam the course of these streams, in order to the formation of a system of defence by inundation. The valleys being laid under water, the progress of an invading force is rendered difficult for infantry as well as for cavalry, guns, and stores. For it is not the depth of an inundation that is usually to be depended on for impeding an advance, so much as the interruption the obstacles hidden beneath the flood cause to regular formations; and, when each stockaded village or bridge may be made the arena of a battle of position, the progress must needs be slow of an enemy who has to force his way across such flooded ground.* And in a war of posts the local knowledge of officers and men should be carefully turned to account. In the Suffolk Artillery the officers have been expected to possess and be able to avail themselves, for the purpose of defensive war, of

* These points would be defended by field-guns and guns of position, drawn by the active horses of the district. Calculation shows that, with a judicious distribution of guns in this district, nine guns can be concentrated within three hours on any point. These movements should be covered by masses of irregular horse and foot, on a regulated scale. Their manœuvres should be conformed to those of the artillery, for, in defensive combat, artillery plays the first part. As respects the effect of field artillery against shipping, a remarkable instance occurs in "Straith's Work on Fortification and Artillery." He quotes a case to illustrate the superiority of ordnance on shore over that in ships. It is taken from the United Service Journal, No. 46. When Lord Lynedoch was advancing towards Antwerp in 1814, a fort of two guns, one an 18-pounder, the other a 5½-inch howitzer, was thrown up on a bend formed by the Polder Dyke, some distance below Lilio. The 18-pounder was at a right angle to the course of the river, the howitzer looked diagonally up the stream. A French 84-gun ship dropped down with the tide and anchored about 600 yards from the battery; from her position she was exposed to the fire of the howitzer only. After a constant fire, kept up for five hours, the French ship hauled off, having had 41 men killed and wounded. The howitzer was not dismounted, nor was the fort injured, and the English lost only one man killed and two wounded. An earthwork to cover three guns solidly can be thrown up by country labourers, at the rate of 40 men per 12 hours.

the knowledge which their local experience has given. And herein lies a main reason for the territorial constitution of the militia service throughout all ranks.

This system would resolve itself into one of moveable batteries of position, as organised originally by Frederick the Great, and served by militia artillery. The guns should be placed on travelling carriages in order to concentration; for coast batteries weaken by diffusion of strength, and at best only present an immoveable resistance to the enemy's plan of operations; and, again, fixed coast batteries indicate those points of strategic defence which would be avoided by a sagacious enemy.

The yeomanry being brigaded, local horse might be trained to act as rocket troops for volley firing, and to cover the guns of the militia artillery in their advance on the coast to which the nature of the service destines them, in addition to their duty of manning coast batteries and martello towers. The militia artillery can be thoroughly trained to all the duties of field gun drill, in addition to heavy gun and mortar drill, for the purpose of accumulating masses of fire on the advance of an enemy. It could be efficiently horsed from the district, and trained to the simple manœuvres of war, and covered by the movements of local cavalry.

The militia then has its special character and uses, which should necessarily be of a local and territorial type. The commanding officer should be thoroughly acquainted with all the military circumstances of the district in which his command lies, in order to inform a general officer both on the weak and strong points of country, the practicable and the broken ground, the coast likely to be selected for disembarkation, and where a battle of position may be judiciously offered and successfully fought. The militia arrangements of a district perfectly prepared against invasion would be these.

The commanding officer, being thoroughly acquainted with the country, would have prepared beforehand the points on which he would make a stand, protected by inundations, epaulements, and stockades, or by fortified villages, which present a very effectual defence on lines approaching to the Redan trace, and generally are very manageable polygons of resistance. The cover is good, and round shot go through the slight houses without doing

injury to the defenders from splinters. The lord-lieutenant, having summoned the deputy-lieutenants, would direct them to cause the necessary works to be executed by country labourers, at the rate of a field-work to cover three guns per twelve hours' labour of forty men. Plain directions should be given, with lithographed sections and working plans. In this system there is no high amount of engineering skill or of strategic arrangement required. Nothing more is asked than that which the nation has a right to expect, namely, that the local military resources of each county should be turned to the best account through the agency of the territorial military authorities of the militia service, namely, the lord-lieutenant, assisted by his staff of deputy-lieutenants and by the commanding officers of the county regiments. The especial grounds for employing a mobilised artillery of militia will be considered in the strategic portion of this Lecture. The system of special training that has been recommended and adopted in an artillery regiment can be applied to the varying circumstances of regiments and counties. The rifle and light infantry regiments will practise open formations; the battalion regiments will be trained to the defence of entrenched posts and to serried movements.

In a word, it is only requisite to utilise the magnificent resources which the United Kingdom places at the disposal of her rulers, to render invasion, so far as human foresight can provide, a vain threat—an impotent intention.

But no employment of insulated fragments of the national strength will be sufficient. The regimental system, however valuable, must be welded into the compact masses which form the available strength of an aggregated people, and it is to this series of combinations, and their probable results, that the argument now proceeds.

It has been shown that the original constitution of the militia service is territorial. It will be trained on its own soil, with which the commanding officer is most familiar. But to derive advantage from this incident of its character and constitution should be added the efficiency produced by combination with other bodies of troops similarly qualified and organised for the peculiar demands of defensive war. Such enlarged action will result from the formation of militia brigades and of militia divisions. Since the introduction

of the divisional system into the French service it has been gradually adopted into the manual of European warfare. But the divisional system should be made to consist with the genius of the militia force, and be territorial also. The regiments raised in neighbouring districts would then be formed into homogeneous brigades, divisions, or even army corps. The brigade should be camped, during the period of training, within the brigade district, and placed under the command of a Brigadier. The late Lord Hardinge, who thoroughly appreciated the value of the militia, observed that the militia required only Enfield rifles and good Brigadiers to make them capable of any undertaking. Moreover, the local yeomanry regiments and detachments of the regular army might be at the same time attached to this command. The brigade should be under canvass, in order to keep the soldier removed from the contaminating influence of billets. "It is better to hear the lark sing than the mouse cheep," and young soldiers are more quickly taught what is useful in the open field than in the most elaborately fitted barracks. Two months under canvass are better than six in hut or barrack to teach and train the orderly and intelligent volunteer.

The accompanying map explains the formation and distribution of the militia brigades. The militia depôt is the alarm-post at which, on the first notice of service, the regiment would assemble, the Brigadier having previously determined the rendezvous of the brigade. At this point the brigade would have been assembled for training during peace,—thence it would be prepared to commence its movements at the stern demand of war.

By this larger application of the principle of special training already noticed to the combined masses of several regiments, the anticipated advantages to be obtained from the manœuvres of a corps on familiar ground will be augmented proportionately to the wider area over which operations are to be conducted. In illustration of the system of working by brigades, the division formed from the combined brigades of the Waveney and the Stour may be fittingly examined. It will be observed that in this quarter of England facilities for invasion are great, owing to a long seabord, a portion of which is indented by creeks, forming natural wharfs for disembarkation of troops. If the advance be made from the coast to

some central point in the East-Anglian counties, it would be somewhat difficult, with the small force of a single regiment, to defend the ground; but if the two regiments of artillery and the five regiments of infantry be united in a pre-arranged plan of operations, substantive and effective resistance would at once be offered to the enemy, and the district might be safely left to the defence furnished by its own resources. And the manœuvres of the united brigades or divisions of East Anglia would be facilitated by the lines of railway. The strategic lines are, those from Norwich to Ipswich and Colchester, and from Lynn to London. The substrategic are those passing from Cambridge to Haughley, from Ely to Norwich, from Lynn to Norwich. The same reasoning would hold good with respect to the militia regiments, distributed, as will be seen, throughout the country in masses convenient for combination, and having as it were a natural cohesion. For, in tracing the brigade districts, the fluvial basins have been followed, as far as possible, in obedience to the law which associates in habits and occupations the dwellers within the same limits of watershed and outfall. The brigades have been named from the principal river of the district. All the operations of war might be exemplified according to the nature of defence proper to the locality, whether of works, of manœuvre, or of fortified posts. For the defence of England must be varied, as is the surface of the soil. The passes of the Welsh hills, and of the more abrupt Lancashire and Cumberland ranges, would be maintained by stockaded works. The long slopes of the Gloucestershire, Yorkshire, and Lincolnshire wolds, would permit the descending impulse to the rush of our infantry which decided Busaco.* On the uplands of the down counties the charge of our horsemen would recal many brilliant passages of arms of our cavalry in foreign fields. The level plains of the marsh districts of the coasts of Lincolnshire and of Somersetshire would form a network of alternating land and water impervious to invading columns. Towns and villages, girt with lines of stockaded earthworks, armed with carronades, against assault *de vive force* would oppose a resistance extemporised, but deliberately prepared. For it is to be observed, that, except for the defence of positions eminently objective, such as

* A slope of 30° multiplies the force o. the descending body of troops by 14.

London, Woolwich, Portsmouth, Plymouth, and Pembroke, permanent fortifications are undesirable, as indicating a foregone conclusion of defence. And the Providence which blesses the peaceful arts and occupations of mankind has, in its wisdom, decreed that the appliances of civilization, and the results of man's toil, should furnish, rightly understood, means of defence equivalent, if not superior, to those which the hand of nature has raised as ramparts of mountain, or spread as belts of morass, around the fastnesses of her wild children, as was well seen when the United Provinces were wrested from the Spaniard.

Assuming then that invasion is to be encountered, it remains to consider what means of resistance the Militia Army of England can oppose. The principles that apply to the English system of defence would be available, with necessary modifications, for the protection of Ireland and of Scotland, as a brief review will show.

Although space does not permit a lengthened developement of the application of these principles to the defence of Scotland and of Ireland, it is easy to indicate briefly the outlines of a defensive system appropriate to each country. The object of an invading force is to occupy the country invaded, solidly, either by continuous advance, or to proceed step by step from the occupation of one portion of country, where defence would be homogeneous, to that of another, and at the same time to obtain a secure position as a base for future operations. Now islands and maritime districts especially favour this strategy. Ireland is divisible into four great masses, corresponding generally to the four provinces, of which three have a natural local frontier, easily defensible towards the interior. The northern line of defence is drawn west from Dundalk, along the old Ulster border, whose passes were forced with such difficulty by Elizabeth's generals, to Ballyshannon, on the Atlantic coast—a line, notwithstanding improved cultivation and drainage, even now of great natural strength. The western line is covered by the wild country stretching from the borders of Fermanagh to the head waters of the Shannon, and thence along the right bank of that river to the ocean. The southern frontier, passing from the west along the mountain ridge of the Queen's County to the upper streams of the Nore and Barrow, and eastward to the Wicklow mountains, marks the frontier which was

watched by the Normans of the Pale. The great plain lying within these bounds must follow the fortunes of the conqueror. An invader, established in either of these three districts, could hold them independently of the others; and, therefore, the system of defence should be special to each of these positions, a reserve being stationed at a point on the central plain, equidistant in calculation of time from the principal debouches of the three provinces.

Of Scotland, it has been remarked, that the parallel range of mountains renders an advance perpendicular to their axes difficult, whilst their prolongation towards the sea on either coast makes it laborious to turn them. Scotland is thus divided into four military districts, each strong in lines of internal defence. The most southerly line is that drawn from the waters of Ayr eastward to the Lammermuir range. The line of the Forth, to its source in the south-western Highlands, gives the next defensible district to the northward. The undulating country lying between the Grampians, the mountains of South Invernesshire, the Forth, and the sea, has the same strategic character as the central plain of Ireland, and in like manner must receive its destinies from operations carried on elsewhere. The line of the Caledonian Canal, by insulating North Invernesshire, Rosshire, Sutherland, and Caithness, determines the third and fourth military divisions of North Britain. Of these lines of defensive or offensive occupation, the most valuable to an enemy desiring to effect a diversion—and in a war of invasion corps would be detached for such a purpose, is that of the lakes extending from Inverness, on the eastern, to Fort William on the western sea. An expedition might surprise Fort George, a work untenable against vertical or even plunging fire from heavy guns, occupy Inverness, and some point intermediate to Fort William, and would there maintain itself at slight risk, and prove a permanent source of annoyance. Its front would be covered by the line of lochs, of which it would secure the passes, and in advance of their main line by the wild country stretching from Glencoe to the eastward, across which cavalry and guns could move on but a few points. The supplies of the well-cultivated districts of Rosshire, Sutherland, and Caithness, lying to the rear, would be put in requisition by the force occupying this line. The principal defence should be made near to

the eastward, on Loch Ness. Fort Augustus, which is absolutely useless from its construction and position, but in the immediate vicinity of very strong ground, should be dismantled, and earthen batteries placed to sweep the approaches on the Loch Ness. On the southern shore formidable cliff batteries might be so placed as to cover with their fire the whole breadth of the loch, and, being commanded from the precipices above, would be untenable under musketry fire delivered from the rugged faces of the mountains which impend over its southern shore, near Fort Augustus. The defiles of this line would be well adapted for the use of the *fougasse pierrier* on a large scale. And it is at this line that an active enemy would make a swoop. It is an admirable line of disorganisation and insult, as affecting the commerce of either coast of Scotland, and threatens the northern centre of the country.

The subject of invasion has been discussed by General Lloyd, Maj.-Gen. Roy, Lieut.-Gen. Birch, R.E., General Sir Harry Calvert, General Sir John Burgoyne, R.E., Maj.-Gen. Lewis, R.E., and Baron Maurice.

But the projects of invasion against which General Lloyd, Maj.-Gen. Roy, and Lieut.-Gen. Birch, elaborated their systems of defence were of dwarfish proportion as compared with those which would suggest themselves at the present day. Their opinions are briefly expressed in the following analysis.

The plan of General Lloyd is of an abrupt character. The object was to inform the Ministry of that day, 1779, as to the probabilities of a successful invasion. He assumes a landing on the south-west coast of England, and interposes three army corps between the army of invasion and the capital. It is also assumed that an expedition will be directed on the Bay of Galway, but solid results are expected only in the west. The chief danger General Lloyd conceives to lie in the occupation of the peninsula of Devon and Cornwall. On a general review of the subject, General Lloyd thinks an invasion both dangerous and absurd. But his French commentators on the translation of 1801 deny that such was his real opinion.

But Lieut.-Gen. Birch, 1808, manifests a very different spirit in the treatment of the great problem. He perceives that the fanaticism of conquest implanted in the Imperial armies must be met by as

resolute a spirit of defence. He estimates with a just discrimination the facilities afforded by the long parallelogram of England for the destruction of a corps by an invading enemy. He had seen Carnot's plan for the simultaneous invasion of Yorkshire, Sussex, and Ireland, and he thinks that defensive works in the nature of entrenched camps should be constructed, in order to take in every possible line of operations. And he lays down this axiom—that the natural lines of defence of this country are rivers. He says, p. 115,

At the angles of the country lying south of the Mersey and Humber are the four great cities of London, Bristol, Hull, and Liverpool. Lines drawn between these points form a rectangle, which may be regarded as a base of military operations against the several quarters from which the enemy may come. To support these, a central position in the west of the kingdom should be formed. And, thirdly, a fortified place should be constructed between each of these towns, which, in conjunction with that in the centre of the kingdom, would give three lines of defence.

He thus distributes these decisive strategic points of defence:—

Central . . .	Rugby or Warwick	on the	Avon.
Southern . .	Oxford or Abingdon . . .	„	Isis.
Eastern . . .	Peterborough or Northampton	„	Ouse, or Nene.
Northern . .	Newark	„	Trent.
Western . .	Bristol (near)	„	Severn.

In fine (he says), our fortifications would enable us to avail ourselves to the utmost of the whole force of the state, to oppose to our invaders a resistance of a very different kind from that of unprepared, distracted, tumultuary warfare.

In the extracts which Sir Harry Calvert introduced from General Roy's papers into his work, we learn the views of the latter writer, and can form a minute estimate of the nature of the country lying to the south-east and south of London, as far as the shores of the Channel. General Roy thus describes the triple barrier interposed between the capital and the sea.

In considering the country to the south and south-east of London, three remarkable ridges run from east to west, through Kent, Sussex, and Surrey. These are—the South Downs, extending from Beachy Head towards Winchester, sloping gently to the Channel, but steep towards the north; the middle range from Hastings towards East Grinstead; the third range begins at Dover and ceases at Farnham. These hills consist entirely of chalk, are steep towards the south, and sloping gradually towards the north. The country comprehended between these ranges is called the Wealds of Kent and Sussex, and is everywhere extremely deep and impassable. To the southward, parallel to this great range, a smaller and lower ridge running in a north-west direction, from Ashford towards Hyndhead, presents a steep face to the south, a gentle slope to the north. It is called the Midland

Range. Romney, Walling, and Guildford marches, and Pett Level, lie on the coast. Tidal rivers divide the South Down into five distinct portions; they are all deep, and permit navigation beyond the north edge of the Downs, with the exception of the Cuckmore. Each separate division then becomes an entrenched camp.

The northern range is divided by rivers which pass through them in their course to the Thames into six parts. The Midland Range is likewise divided into distinct parts by rivers, but the Medway alone is tidal.

The theory of defence of this district is founded on the natural strength of the front, and on the protection of the right flank by the Chalk Hills, and of the left by the sea, assuming the command of the Thames. The Midland Range would be defended at Kent Hatch, Sevenoaks, and Mereworth, and the great chalk hills near Westerham, Dunton, and Wrotham.

To protect the South Downs, the army might assemble—Chichester right, New Shoreham centre, Newhaven or Seaford left. Three good communications parallel to the coast cross and connect all the routes. The many roads which lead from every point of this great circumference of coast from Margate to Chichester are united at about thirty miles from the capital into eight principal ones, London being a common centre from the Reculvers to Selsea, with a radius of from 60 to 70 miles.

In the calculation of chances, Sir H. Calvert observes:

An armament from Brest must escape our guard fleet, and an armament from the bays of Brittany must elude our squadrons at Jersey and Guernsey, at Portland, Torbay, and Plymouth.

Considering then the natural strength of the country and the value of the strategic lines of communication both by road and railway, the facility with which 60,000 men with a support of 20,000 could be massed along the eight points of assault, together with the protracted and subsidiary defence of Tunbridge, a sub-objective point of attack, it appears that an enemy would not attempt the triple line of strong positions, which would only lead him ultimately up to the most defensible posts, after a series of desperate and prolonged encounters.

Wherefore, as an alternative, the open ground lying on his immediate front, on landing westward of Beachy Head, would present itself as the most favourable theatre of operations.

Strategic combinations on the valleys of the Kennet and of the Thames would leave him master of his movements, and able to concentrate and to refuse or give battle so long as the communications with the sea were uninterrupted, and the sea secure.

The hypothetical invasion projected by Baron Maurice clearly testifies in the breadth of scope, accuracy of calculation, and subtlety

of analysis, how wide would be the range of preparation for so great an enterprise.

An invasion then being determined on, on a scale suitable to the great prize to be won, let its probable dimensions be accurately examined. For this purpose, Baron Maurice's plan furnishes ample data. It has been well digested in the sense of military dynamics, leaves nothing to be assumed, and supplies the reasoning on which each step in the problem is successively justified. Nor is this calculation of an hypothetical campaign, based on mere speculation. The calculations of Napoleon at Boulogne are quoted, as well as the positive results of the expedition to Algiers and to Civita Vecchia. To these may now be added the experience obtained in the transport of the Allied Armies to the shores of the Crimea, on the scale of one steamer and two transports per 1,000 men, as shown in the accompanying map.

Baron Maurice's plan, as quoted by General Lewis (Prof. Papers, R E. vol. ii. Second Series, pp. 105—125), is thus conceived.

Napoleon being obliged to select the shortest line of passage for his invading force, on account of his transports being of small tonnage, was restricted to a narrow base of operations; but with steam power the whole coast from Brest to Calais becomes a base. Let the two great military posts of the Channel, Brest and Cherbourg, be the points of departure for the invading squadrons:

From Brest to Plymouth, 166 miles . .	17 hours.
,, Brest to Bristol, 270 miles . . .	27 ,,
,, Cherbourg to Rye, 138 miles . .	14 ,,
,, Cherbourg to Portsmouth, 84 miles .	8 ,,

But let the maximum time be taken at 34 hours, to allow for the delays unavoidable in convoy sailing. Three points of disembarkation would be selected. The first on the Avon at six marches from London; the second at Plymouth; the third at Rye—three marches from London. The first point would furnish the line of operation to interrupt the communication between the north and south-west of the country, and would be in communication with the second; and for thus separating the invading forces there are two reasons; first, that it is more easy to find transport and subsistence for three army corps than for the combined force of 150,000 men, and that it is best to force the British troops to act against three army corps separately, the small number being the weak point of the British. But the movements must be simultaneous and concentric on London. A military post must be seized in order to shelter the fleet of disembarkation, to secure a firm footing on the English soil, and in order to appropriate at once the matériel of war.

Plymouth is selected because the Sound cannot hold so large a defensive fleet

as would lie at Spithead, and the approaches of Portsmouth are the stronger; but a disembarkation at Whitesand Bay, to the west of Plymouth, will be the most advantageous, and enable the army to turn the position, and commence the siege of Plymouth Dockyard from the side of Devonport. The fall of Plymouth insures that of Dartmouth and Falmouth, and the possession of Cornwall and Devonshire. Plymouth having fallen, the expeditionary army corps would take Portsmouth on the march upon London, and therewith a new point of support and rendezvous for convoys from Cherbourg, Havre, and Dieppe. The objective point of attack must be the capital (the forces composing the three army corps are given below). The regular forces (1850) amount to 120,768 men of all arms; of enrolled pensioners, dockyard battalions, militia, and yeomanry, 56,141—in all 179,909 men; but of available trained soldiers 64,432 men, making three divisions of 21,477 men and 28 guns each. Each army corps will occupy the following time in reaching its destination from London. To Plymouth, 88½ hours; to Hastings, 79 hours; to Bristol, 80¾ hours; but to this must be added the time necessary to concentrate these troops in London, which will cause 10, 9, and 9 days respectively to elapse between the signal of alarm given at each of the invaded points and the arrival of the relieving force; and an advanced guard, disembarked during a naval action and the bombardment of Plymouth, would cut the rails, or prepare a masked battery to crush the first train and make the troops prisoners. The question of transport is more difficult; but, in the expedition to Civita Vecchia in 1847, six frigates of 450 horse power, two corvettes of 220 horse power, one corvette of 160 horse power, and two transports in tow, transported in ten days from Toulon 10,000 men. For the expedition to Algiers in 1830, 37,507 men, 4,512 horses, and 180 guns, were embarked in three days, and transported in fourteen by 100 vessels of war, of which only seven were under steam, and 602 transports of all classes. The distribution of men of war and transports betweeen the three army corps would be as follows:—

Strength of INVADING FLEET.

	Army of			Total.
	Bristol.	Plymouth.	Rye.	
Line-of-battle	4	10	10	24
Frigates, sail	10	19	9	38
,, steam	6	8	7	21
Corvettes, steam	20	. .	2	22
Merchant, steam	66	66	159	291
Transports	78	85	199	362
Corvettes, sail	. .	. .	30	
Brigs	. .	. .	44	
Transports	. .	. .	38	
Cutters and Sloops	. .	1	50	
Vaisseaux, steam	. .	. .	1	
Corvette and Frigate	. .	2	1	
Avisos, steam	. .	19	34	

It will be remembered that diminished length of sea transport is equivalent to increase of tonnage.

In 1845 the home squadron of the Royal Navy was of 6 ships of the line and 6 frigates, without calculating war steamers. The fleet of invasion reckons 224 ships of war. The troops required for the expedition would be drawn from the nearest garrisons. As respects the time required for embarkation, the expedition to Algiers of 37,500 men was embarked in three days. As respects the plan of defence, when the capital is the centre of national life, the metropolis must not be opposed to the risk of a sudden bold attack. If Vienna in 1805, Berlin in 1806, Madrid in 1808, had been fortified, the results of Ulm, Jena, Burgos would have been different; and if Paris in 1814-15 could have held out for eight days, what might have been the effect on events?

It is wise, then, to establish a number of strong points on the coast. And, as it appears that public opinion will never permit London to be fortified, the best resistance to an invader would be found in entrenched camps, connected by railways, and on the indications given by Colonel Lewis, namely, at Shooter's-hill, Croydon, Kingston, Windsor, Marlow, and Highgate. These camps should be of a mixed character—of works erected in brick, and covered by bastioned lines with detached batteries. Six or seven camps placed round London, at 10 or 15 miles distance, would give an army of 60,000 double value, especially of Englishmen, the firmness and phlegm of whose national character render them peculiarly adapted to fighting defensive battles.

Hence follow three main deductions,—

First. Railroads only assist defence in a certain degree.

Secondly. That the capital must be covered, and the coast abandoned, as regards the creation of new fortified points.

Thirdly. Whatever be the system adopted, the land forces must be increased, because a fleet alone cannot hinder a disembarkation on the English coast.

It may be inquired whether this publication be opportune? If it is to be hoped that peace be not troubled, and that the great powers be agreed, in order to the repression of the revolutionary spirit, who can foresee the disturbances to the European equilibrium which may arise in Egypt and at Constantinople? England is justified in confiding in her maritime superiority, but it would be wise not to conclude thence that she is invulnerable. Steam navigation, railways, and the electric telegraph increase her means of defence, but they also facilitate the modes of attack, and smooth the highways that lead to her shores.

In the valuable notice of Baron Maurice's plan, which Major-General Lewis has prepared, he adopts the possibility of an armament reaching our shores; but considers it improbable that any landing with an army will occur to the westward of Hampshire.

Forces should be distributed in certain localities in permanent barracks to hold 2,000 men of all arms, calculated to meet any attempt at landing. Additional resources should be maintained, in the establishment of a few well-fortified places, parallel with, and at some distance from, the south coast, and in a range

of entrenched camps in the vicinity of London. The landing is to be encountered by troops moving along the line of railway, parallel to the hostile fleet, and it is assumed as an axiom that no landing could be effected in the presence of 2,000 men well prepared. Then Ashford, Battle, Lewes, Shoreham, and Chichester should be fortified, at an outlay probably of 600,000*l.* and the barrack stations referred to above might be made secure against desultory attacks, and occupied by irregular troops, in the absence of the regular forces. Three places of arms should be formed to defend the approaches to the capital: one near Tunbridge Wells; secondly, near Balcomb; thirdly, on the Avon River, about 15 miles from its mouth. These works should be strong enough to require siege operations to reduce them, and would cost about 600,000*l.* The available troops should be formed into three divisions: three-fifths to dispute the advance to London; one-fifth to hang on the enemy's flank to the eastward; one-fifth on his flank to the westward. The enemy must then divide his force into four parts: one to secure his position on the sea-shore, two to secure his flanks, and the major part to move on London. The attempt is assumed to be made with no less than 100,000 men, reduced to 80,000, to secure the point of departure and flanks, and moving in three columns at the rate of 10 miles a day. On the third day the force would be reduced to 65,000 men, by detachments to invest the fortified places right and left. On the fourth day he might be compelled to fight a pitched battle on some advantageous position prepared for it, probably near Reigate. For a system of defence capable of meeting the contingency of a near approach to London, an advantageous line might be extended from Woolwich to Windsor, the fortified places being Woolwich, New Croydon, and Kingston-on-Thames (Windsor). If these points were occupied in strength, it would be impossible to pass between them. If it be asked, Why diminish an effective army by garrisons and detachments? it may be observed that at the commencent a very large portion will be unfit to take the field and meet the enemy in battle, but could be well employed in garrisons, and brought gradually into an effective state, by acting on the flank of the enemy. It would be difficult at the commencement of hostilities to collect more than 50,000 regular effective troops; to this force would be required 50,000 of the army in reserve, and another 50,000 of local and partizan corps.

There is another name which must not be left unnoticed, associated as it is with the prophetic warnings of England's greatest soldier, and with honourable experience in historic, no less than in recent, fields. Here, and now, I am not permitted to say more, yet I may record my belief that by all who would combine each element of national strength for the defence of the realm, Sir John Burgoyne's example and counsels will be justly prized.

Yet it is scarcely to be imagined that the powerful chief of an hostile coalition would restrict operations to so narrow a theatre, or to such comparatively small forces.* Granted that the country south

* Has it not been said, "Our three armies of Brest, Cherbourg, and Antwerp

of the Trent, of the Avon, and of the Thames, were occupied in force, yet the great seats of manufacturing industry and of commercial enterprise lie untouched. Portsmouth and Plymouth may be blockaded, but the waters of the Mersey still bear the commercial navy of the empire. London may be threatened, but the circle drawn from the Exchange at Manchester, which numbers no fewer souls, nor less wealthy, than one of equal radius drawn round the Stock Exchange of the capital, still carries forward its cosmopolitan enterprise. In the north still vibrate the unwasted sinews of war; in the northern districts still rise unexhausted many of the deep well-springs of Britain's greatness! But the railway system of London may be made to form an effectual defence of the capital. London is now surrounded and traversed by railways. All the external lines have deep re-entering angles, with the exception of the North-Western, which might be broken by throwing out works, as batteries are projected from a parallel. The others might be treated as ramparts, and guns on dwarf traversing platforms could be planted in the thicknesses of their mounds, and some, fitted on field carriages might traverse the lines on trucks, for occasional service.

On referring to the map it will be seen that a zone of communication stretches from North Woolwich on the left hand of the Thames, to Woolwich Arsenal and Dockyard on the right. Let this zone be divided into six artillery districts of defence. Thus: 1. from North Woolwich to Stratford Station; 2. from Stratford Station to West London Junction; 3. from West London Junction to the bank of the Thames; 4. thence to Clapham Station; 5. from the Clapham Station to Norwood Hill; 6. From Norwood Station to Woolwich. Project in advance of these lines strong posts, and the metropolis is secured by a belt of defence, not less valuable than that which girds *Paris*. Armed platforms might steam-guard along these lines; and, while the defence of the capital would be secured, the communication with the country need not be suspended, since the masses of defence would be accumulated

would have fallen on their central masses, while our wings would have turned them in Scotland and Ireland?" Again, it is an error of Baron Maurice to consider the possession of London as decisive in this struggle. A second campaign, and some more, would be required, for which the expeditionary army corps would have prepared bases of operation.

on the lines connecting the arteries of traffic with the capital. And a positive result would be obtained by placing a large portion of London beyond the reach of bombardment, the result of greatest value in the system of *enceinte continue*. And, if the zone be pierced at any point, the trace is such that the defenders take the advanced approaches of an enemy in reverse; giving an example of "la défense avec des retours offensifs." Again, on the open ground to the westward, within the line of railway, a defence might be prepared on the plan of that of the plain of Toulouse, and a *place d'armes* formed for massing columns of sortie.

Such being the power of metropolitan defence, it is reasonable to calculate that subsidiary expeditions would accompany the main body of invasion, of which the strength is calculated on the previous data, varying according to their designed use.

						Guns.	
	Infantry.	Cavalry.	Artillery.	Engineers.	Waggon Train.	Field.	Siege and Position.
Bristol	25,000	5.000	1,000	500	661	100	
Plymouth	25,000	5,000	10,250	2,000	887	100	66
Rye	60,000	12,000	2,500	500	1,502	250	20
	110,000	22,000	13,750	3,000	3,050	450	86
Chester	22,000	2,000	1,000	500	661	100	
Lancaster	8,000	1,000	1,000	500	661	50	50
Durham	8,000	1,000	1,000	500	661	50	50
Humber	13,000	2,000	1,800	750	1,200	90	50
Yarmouth	13,000	2,000	1,800	750	1,200	90	50
	174,000	30,000	20,350	6,000	7,433	830	286

The army corps of Chester is designed to co-operate with the manœuvring army corps of Bristol, Plymouth, and Rye. The expeditionary corps of Lancaster would observe from an intrenched camp and harass the north-western manufacturing districts without engaging itself in the rough country of the Lancashire border, or amongst the numerous towns of that region. The corps of Durham would form an intrenched work, defended by their 50 guns of position, and exert similar preponderance on the great coal districts, and be also prepared to move southwards to effect a junction with the army corps of the Humber, or to operate a diversion in

aid of the *corps perdu*, projected and intrenched on the northern shore of that estuary. The army corps of the Humber would endeavour to force its passage along the high ground of the Lincoldshire Wolds towards Newark, and the army corps of Yarmouth would be designed to overawe and control the eastern counties, from a camp fortified and designed to form on the other points of disembarkation of the expeditionary corps a maritime and intermediate base of operations. It now remains to consider the strategic value of this distribution.

It is assumed, for reasons already given, that the army of Rye will not attempt the passes and positions of the South and North Downs, and of the wolds of Sussex and Kent. Should such an advance be attempted, the reserve of London and of the brigades of the Medway, South Thames, and Itchen, will occupy strong positions also, which are projected in advance of the sub-objective point of Tunbridge, which would be intrenched on lines converging from the landing-places of the invading force, while the regular troops would proceed by a flank movement to occupy the posts indicated by the yellow masses in position on the approaches to London.

But, if this movement be abandoned, the main body of the army of Rye would be divided into two columns, moving on a sub-objective point near Reading; the objective point of the first period of the campaign being London. Two points would be kept mainly in view by an invading force, the one to move on convergent lines of operation, as far separate as would be consistent with security, acting on Napoleon's maxim, "Divide to subsist, concentrate to fight," and through a country which should admit of those operations of war on a great scale, in a knowledge of which the national army would be reputed deficient. Nor would there be any real danger in this separation. The columns would advance, leaving Portsmouth observed by sea, and by the division left to maintain communication with the points of disembarkation east and west of that fortress: the interposed space would then be free for conveyance of stores, and for transport of various kinds.

The western column of the army of Rye would gradually connect its leading brigades with those of the army of Plymouth, and, feeling to the centre, would halt at a point previously decided upon, and

lie ready for ulterior operations. The army of Plymouth having in like manner masked that fortress and intrenched camp beyond the Tamar, would take up a position on the proper left of the army of Rye. The army of Bristol, projecting the leading divisions at once to the eastward, would dispatch a strong corps for some distance to the northward, in order to co-operate with the army of Chester, and to afford assistance, if it were entangled or blockaded in the valley of the Upper Severn. The expeditionary division of the Humber would detach a brigade, as has been shown, to observe York and the northern line of communication with the divisions at Durham; and, passing southwards, would feel its way in the direction of the valleys of the Thames and Kennet. The whole force would thus be distinguished:—armies of manœuvre, Rye, Plymouth, Bristol, Chester; army corps of occupation, Lancaster, Durham; army corps of observation, Humber, Yarmouth.

Thus, then, the invading force having landed, and being in its primary position, moves on the valleys of the Thames and the Kennet. The second position would be to mass the armies of manœuvre on an acute angle, formed by a line drawn from east to west, through Newbury, Hungerford, Marlborough, Chippenham, to a point on the Bristol Railway, near Chipping Sodbury, and thence north-east to Gloucester and Cheltenham. In fact, the campaign, if advanced to such a point, would resemble, in the chequered dissemination of forces, the commencement of the campaign of 1809, when the Austrians assumed the offensive.

Let the distribution of the British troops be now considered. The militia brigades have been assembled at the alarm posts, and are prepared for fight, in the country familiar to their chiefs, in which positions are already selected. Their duty is to arrest the first advance, and to fight battles of position, or, at least, to watch the advance: and here it will be asked on what ground the advance is specifically assumed. The objective point determines the general direction; the sub-objective point the special direction—railways, and canals, the particular course that an army must pursue. In considering the country through which these means of communication are carried, it is evident that they usually furnish the most direct and level routes along which an army can advance. So long

as they are in the possession of an advancing force, these lines of iron or water facilitate the transport of the heavy stores and guns of an army, and even if stripped of rail, or laid dry, in the former case would still supply convenient lines of movement. And where an advance is made by the armies of Bristol, Plymouth, and Chester, on the prolongation of lines of railway, their value is as indisputable as it will be when they pass from flank to flank of a manœuvring army. Thus, then, it may be assumed, that railways and canals will determine the main line of operations in this country, and, on the other hand, the neighbourhood of towns, or of urban districts, will be avoided, as a passage must be forced with certain loss whenever these obstacles cannot be turned; it being, moreover, contrary to the tactics of invasion to engage in skirmishes. But the advance will still be exposed to the risk of being engaged by the flanking corps formed on a re-entering angle.

Railroads, again, may be divided into the strategic and the substrategic. The strategic maintain the communication of corps, and are parallel to the line of battle; the substrategic connect the line of battle with the baseof operations. The principle, both of the advance and defence, is best illustrated in the movements of the army of Chester. It moves on the sub-objective point, Reading, along the line of the railway passing between the natural obstacles of the Welsh hills and the artificial impediments of the Pottery districts, as well as of the rocks of Derbyshire, which Sir Charles Napier has described as a fortress. But it is watched by three distinct corps, each manœuvring from a distinct base, and independent in action, though capable of combination for mutual support.

In preparing the campaign of resistance as opposed to the campaign of invasion, the field army of manœuvre is concentrated on a central district. The three arms of the regular service, with yeomanry cavalry, are held in depôt within a space 30 miles square.

The militia brigades of England, at the invasion establishment of 120,000 men, stand massed in direct relation to the invading corps; 5 per cent. will be deducted from the effectives of the invading forces, in order to allow for detachments, &c.

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Railroads, again, may be divided into the strategic and the sub-strategic. The strategic maintain the communication of corps, and are parallel to the line of battle; the substrategic connect the line of battle with the baseof operations. The principle, both of the advance and defence, is best illustrated in the movements of the army of Chester. It moves on the sub-objective point, Reading, along the line of the railway passing between the natural obstacles of the Welsh hills and the artificial impediments of the Pottery districts, as well as of the rocks of Derbyshire, which Sir Charles Napier has described as a fortress. But it is watched by three distinct corps, each manœuvring from a distinct base, and independent in action, though capable of combination for mutual support.

In preparing the campaign of resistance as opposed to the campaign of invasion, the field army of manœuvre is concentrated on a central district. The three arms of the regular service, with yeomanry cavalry, are held in depôt within a space 30 miles square.

The militia brigades of England, at the invasion establishment of 120,000 men, stand massed in direct relation to the invading corps; 5 per cent. will be deducted from the effectives of the invading forces, in order to allow for detachments, &c.

FOREIGN.

Armies of	Infantry.	Cavalry.	Artillery.	Total.
Bristol	25,000	5,000	1,500	31,500
Plymouth	25,000	5,000	12,250	42,250
Rye	60,000	12,000	3,000	75,000
Chester	22,000	2,000	1,500	25,500
Lancaster	8,000	1,000	1,500	10,500
Durham	8,000	1,000	1,500	10,500
Humber	13,000	2,000	2,550	17,550
Yarmouth	13,000	2,000	2,550	17,550
				230,350
	Waggon Train . .			7,433
				237,783

ENGLISH (MILITIA).

Armies of	Infantry.	Cavalry.	Artillery.	Total.
Bristol	9,659	. .	. .	9,659
Plymouth	12,364	. .	1,843	14,207
Rye	8,992	. .	1,650	10,642
Chester	20,622	. .	429	21,051
Lancaster	11,860	. .	969	12,829
Durham.	8,428	. .	753	9,181
Humber	18,210	. .	. .	18,210
Yarmouth	10,408	. .	1,041	11,449
Reserve	10,585	. .	. .	10,585
	111,128	. .	6,685	117,813
	Disposable .		. .	2,187
	Invasion Establishment .			120,000

It appears, then, that on four points the militia army corps are either of force nearly equal, or superior, to the enemy. On one the enemy has a slight advantage. On the remaining three points well-posted and efficient corps wait the advance of the enemy on lines perpendicular to his lines of operation. The militia artillery, on the service scale, gives, in combination with the proposed force of Royal Artillery, a large superiority of fire. The only corps which encounters any real risk of being out-manœuvred is that composed of the Wye and Trent regiments, thrown across the advance of the army corps of Chester.

A main advantage claimed for this system of defence is in the

movement of the national force on interior lines of operation. The principal masses of army corps and divisions, with the exception of the western, are near the central line of strategic defence, and could communicate sooner with the central army of reserve by sheer marching, than the corps to which they are opposed. Thus the central British force to the northward of the Isis would have the same preponderance, strategic and dynamic, as the French armies assumed on their advance from Dunkirk to Strasbourg, in 1793, although the power would be applied from the centre and not from a flank. So soon as the manœuvres of invasion became developed, the central army of reserve would put in motion the masses which had been collected on certain fixed points. For the fixity which is fatal on the circumference is essential where movements are determined from a centre. Intrenched camps to cover magazines, but not for special military purposes, might be formed in the neighbourhood of the Lincolnshire Marshes, in the Isle of Ely, or on the Glastonbury Flats. But decisive strategical points might be selected with caution for the establishment of military intrenched stations; as on the west of the Tamar, the need of which was foreseen by General Roy; at Newark, Worcester, Colchester, and Reading, though this last can be easily turned. Dorchester also should be occupied, lest the army of Plymouth should adopt it as an eventual basis, or a detachment from the west column of the army of Rye secure it in order to open communication with the army of Plymouth. Let the cavalry of the field army, mustering 25,000 sabres, be massed in the open country to the eastward and south-eastward of Oxford; 300 field-guns of the royal artillery would find an advantageous position to the south of or resting on the Great Western Railway, and, in front of all, place the glorious arm of English war, 25,000 of her regular infantry. A reserve of militia covers London and assists to secure the East-Anglian district. It must be always borne in mind that the flank limits of advance in masses are traced by marsh and river districts in natural tactics, by urban, mining, and manufacturing districts in artificial tactics.

A reserve of pensioners should be posted in an intrenched camp, whence communication might be maintained with the northern militia army corps and the field army of manœuvre.

Let Lichfield, Leicester, Northampton, and Warwick be enclosed in intrenched camps, forming the angles of an equilateral parallelogram, whereof the sides equal 28 miles. These 40,000 pensioners will reinforce the corps lying near them, if required, or release a portion for field duties. They will communicate by railway with the various sub-objective points of the invading army corps, or with the line of defence of the valley of the Thames.

The tabulation of forces will be as follows:

FRENCH.		ENGLISH.		
Army of Bristol . .	32,161	Militia, Bristol . . .	9,659	
„ Plymouth . .	43,337	„ Plymouth . .	14,207	
„ Rye . . .	76,502	„ Rye . . .	10,642	
				34,508
	152,000	Cavalry, Regular		7,000
Deduct 5 per cent. . .	7,600	„ Yeomanry . . .		18,000
		Infantry, Regular . . .		25,000
	144,400	„ Pensioners . . .		40,000
		„ Mil. Reserve . .		10,585
		„ Royal Artillery .		6,000
		„ Engineers & W.T. .		4,000
				145,093

It appears then that, deducting the very low proportion of five per cent. from the invading force, to represent the corps engaged in the observation of Portsmouth and Plymouth, defended by the ordinary garrison, and by dockyard battalions, the posts of communication, and the sick, as compared with the casualties in the national forces, the invader could bring into line of battle fewer combatants than the national army, whose numbers are, *à dessein*, calculated on the narrowest and least favourable basis. No account has been taken of the volunteer forces, who with skilful handling would do excellent service. No muster has been made of the bold veterans, who, having already given their blood for England, would infuse into undisciplined valour the skill which makes that valour triumphant. A single division of the Scottish militia has been placed in observation on the north-east frontier of England. With that exception, no corps has been drawn from the 30,000 Irish and 10,000 Scottish militia. The question has been treated as purely one of military

dynamics. But the system here proposed points to some inferences that may be not unworthy of notice.

A strategic system, based on fighting battles of position, requires careful study of ground, and the training of a numerous and complete artillery, royal and militia. It necessitates continuous training of the militia army of reserve, special in the first degree, more extensive in the second. It demands the habitual manœuvring of troops of all arms together.

Moreover, it requires a plan of campaign to be prepared, which in England is easy, seeing that the conditions of invasion can vary but little. No general ever regretted the study and labour that were given to consideration of a plan of campaign in a country where the points of attack are limited and defined. It was well known to myself and others, in 1837, that Marshal Radetzky had matured plans for the defence of Lombardy against French aggression, and his prevision was justified by the success of the war with the brave and unfortunate Charles Albert. And in forming such plans the history of the War of the Revolution will furnish pregnant examples.

The campaign of 1813 in France is of high value, as a school of instruction for such as shall defend a plain country with national forces. And let it not be forgotten that English ground furnishes space enough for the shock of larger armies than those her fields have ever seen embattled. A line drawn eastward from Port Patrick to Sunderland, thence through Newport in the Isle of Wight to Launceston and northward to Port Patrick again, represents the area within which the war of liberation of 1813 was fought out by 800,000 combatants. A square of which the angles shall rest on Chester, Horncastle, Croydon, and Bristol, marks a space equivalent to that within which 450,000 men contested the supremacy of Europe in 1814.

Let us now consider the circumstances of the campaigns and battles which most resemble those which would presumably be fought by a militia army as a main element of national defence by land forces. It should be noticed here that improvement in musketry fire, while it necessitates battles of position, enhances to the British troops their well-known advantage in that style of

combat, while the more open formations which must be adopted in order to avoid loss from accurate fire will increase the power of the troops who prefer the hand-to-hand conflict of the bayonet to mass-firing in the open field; and young troops will have time to be trained in event of invasion to do good service with musketry fire till they have learned to abide the shock of steel.

If the assumption be correct, that the special destination of militia is to fight battles of position, then the types of militia actions will be found in those battles which were fought at the early part of the present century, for the purpose of arresting an advance, rather than as a portion of a campaign-plan of manœuvre. Thus Borodino, Lutzen, Bautzen, in open field; the defence of Smolensko, Valentina, Dresden, Soissons; and the combat of the plateau of Craonne; indicate the conditions of battles which might be fought successfully by troops trained to a war of positions. Parallels abound for the primary positions indicated in this lecture. The dissemination of troops in the campaign of Italy in 1796, at the victories of Monte Notte, Mondovi, and Millesimo, and before the battle of Lonato, teach how distinct army corps may be made to combine their action. The line of operations of the invading army corps of Chester on its advance would resemble closely that which Charles XII. adopted to his ruin after the defeat of the Russians at the earlier battle of Smolensko.

It has then, in conclusion, been shown—

That invasion on an unprecedented scale is possible.

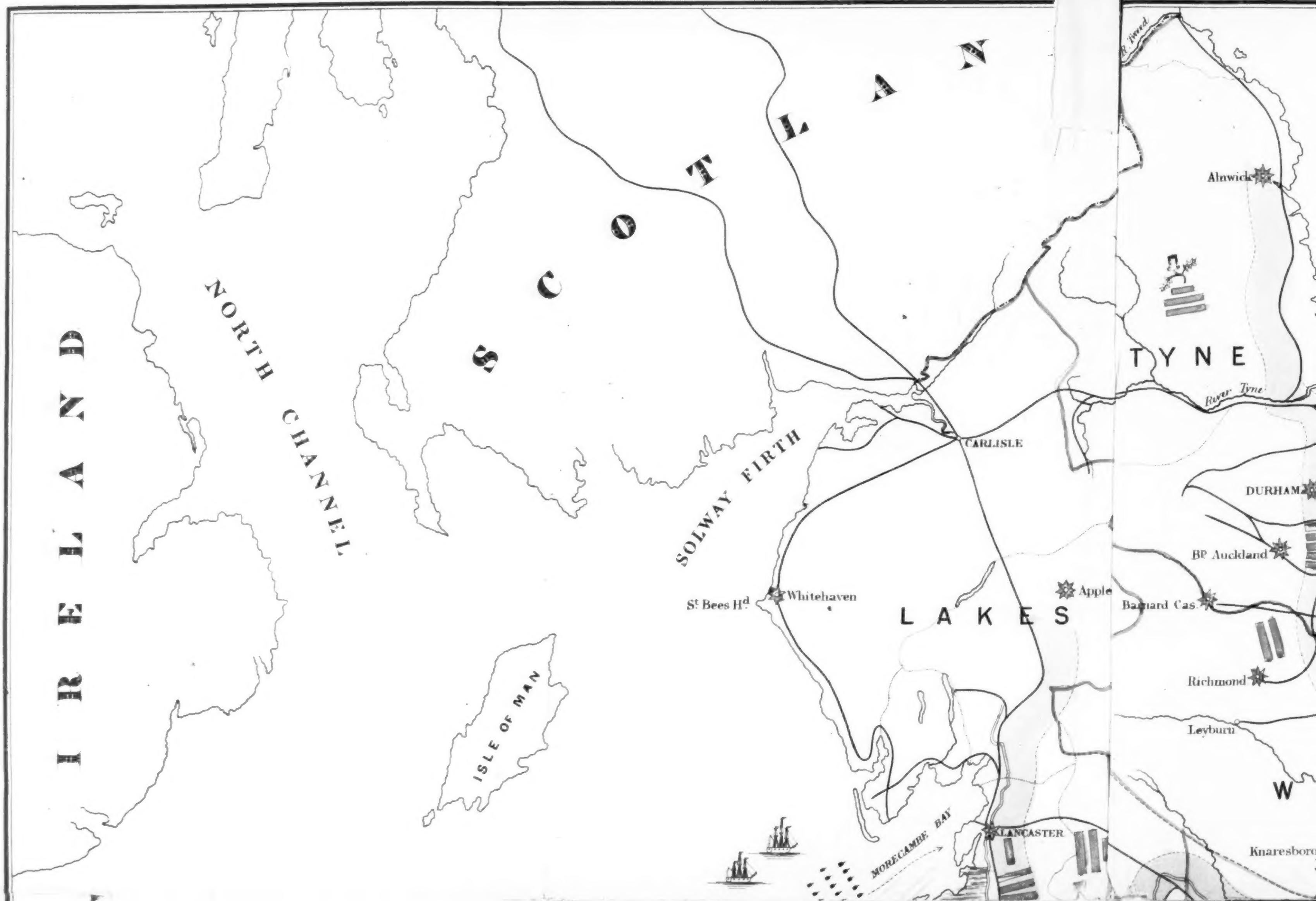
That the existing resources of the country are able to defeat invasion, without recourse to extraordinary means.

That the principal element of defence is a continuous preparation and training of the militia army of reserve, effective in its simplicity.

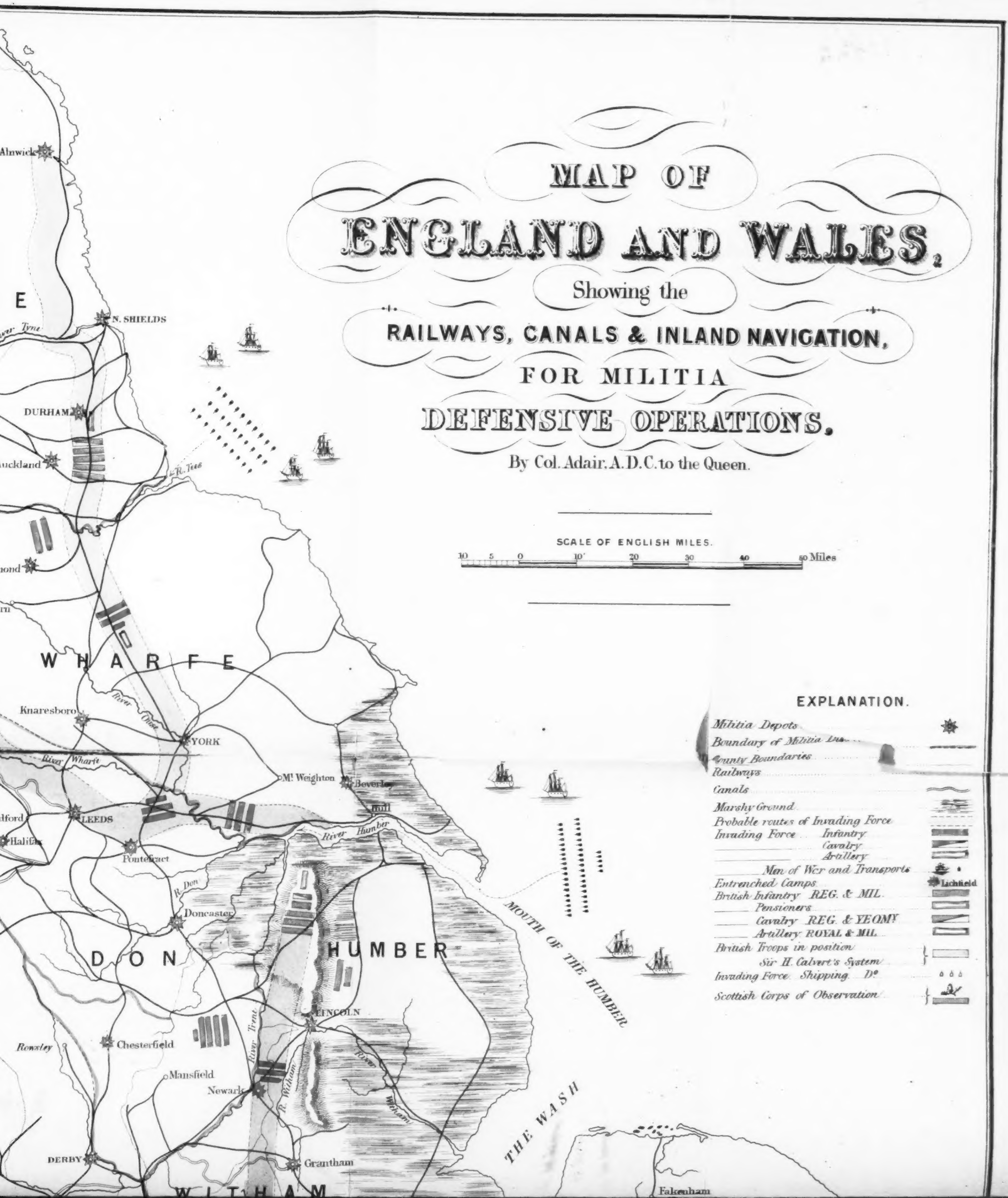
That, while the immoveable *cordon defensif* is the worst of all means of defence,

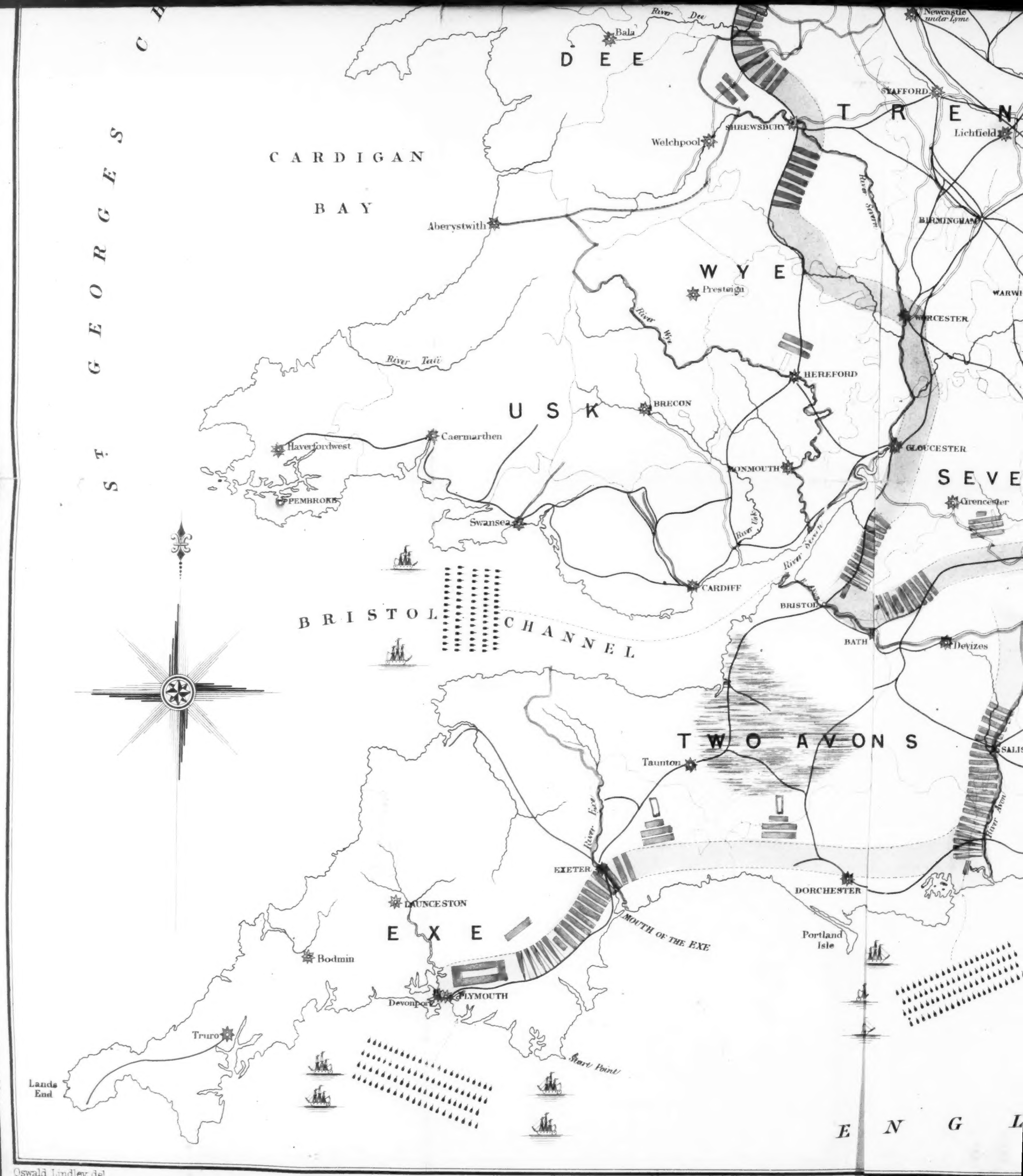
A mobilised system of defence, acting by interior lines of operation, is the most effectual.

That by adopting the militia service into a recognised position in the military system of the empire, its efficiency may be permanently and cheaply increased to any extent.



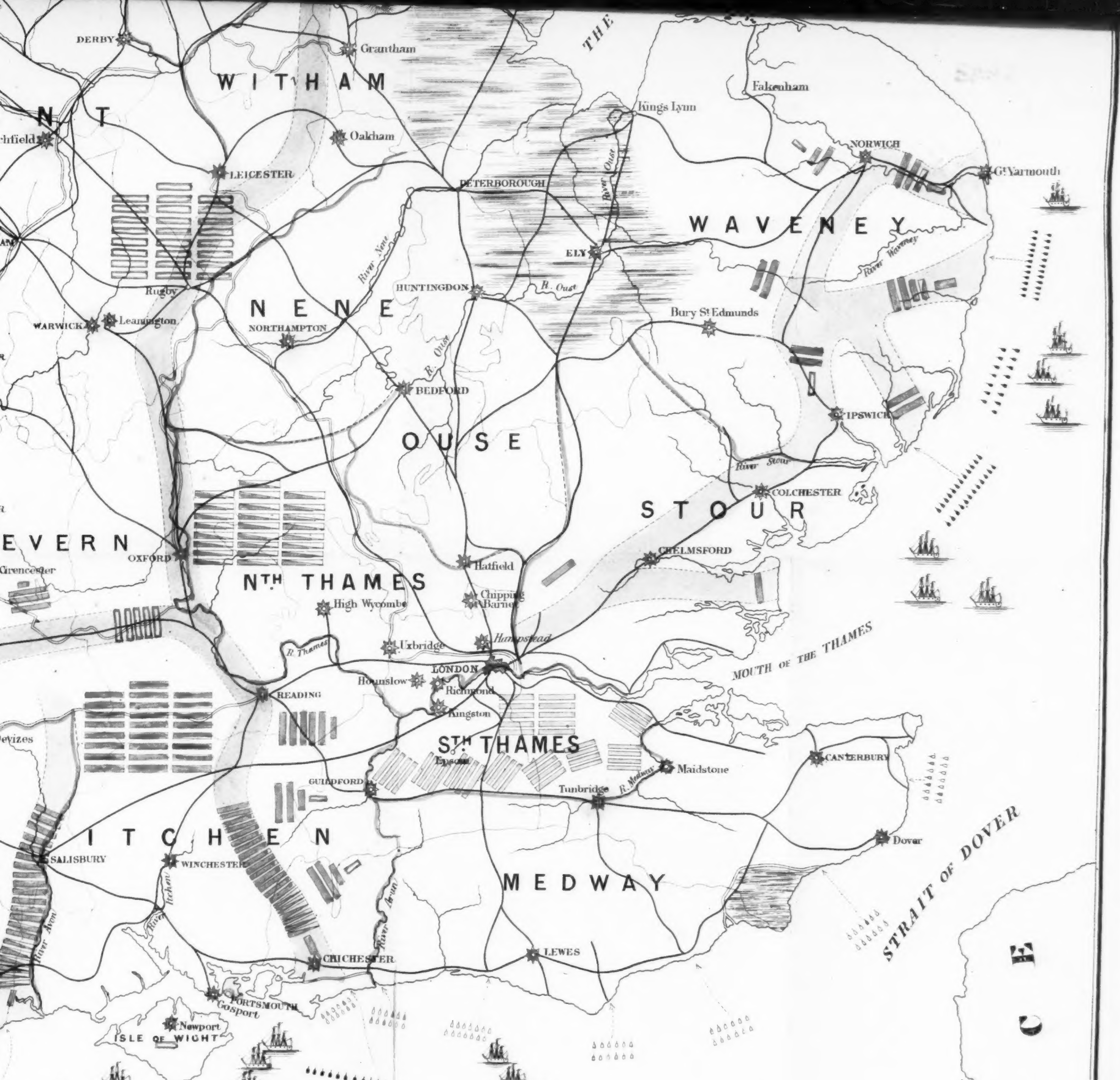
SCOTLAND
IRELAND
NORTH CHANNEL
SOLWAY FIRTH
CARLISLE
St Bees Hd
Whitehaven
LAKES
Apple
ISLE OF MAN
MORECAMBE BAY
LANCASTER
IRISH SEA
Preston
River Ribble
Burnley
Bradford
Halifax
Bury
Wigan
MERSEY
LIVERPOOL
Warrington
MANCHESTER
R. Mersey
River Dee
BEAUMARIS
CARNARVON
CARNARVON BAY
CHANNEL
Mold
CHESTER
Wrexham
Newcastle under Lyme
River Dee
Bala
DEE
Rowsley
Alnwick
TYNE
River Tyne
DURHAM
Bp Auckland
Barnard Cas.
Richmond
Leyburn
Knaresboro


MAP OF
ENGLAND AND WALES,
Showing the
RAILWAYS, CANALS & INLAND NAVIGATION,
FOR MILITIA
DEFENSIVE OPERATIONS.
By Col. Adair, A.D.C. to the Queen.
SCALE OF ENGLISH MILES.
10 5 0 10 20 30 40 50 Miles
EXPLANATION.
Militia Depots
Boundary of Militia Dis...
County Boundaries
Railways
Canals
Marshy Ground
Probable routes of Invading Force
Invading Force Infantry
Cavalry
Artillery
Men of War and Transports
Entrenched Camps
Lichfield
British Infantry REG. & MIL.
Pensioners
Cavalry REG. & YEOMY
Artillery ROYAL & MIL.
British Troops in position
Sir H. Calvert's System
Invading Force Shipping Do
Scottish Corps of Observation
Alnwick
N. SHIELDS
Tyne
DURHAM
R. Tees
WHARFE
Knaresboro
YORK
River Ouse
River Wharfe
Mt. Weighton
Beverley
Hull
LEEDS
Halifax
Pontefract
River Humber
R. Don
Doncaster
DON
HUMBER
MOUTH OF THE HUMBER
LINCOLN
Chesterfield
Rowsley
Mansfield
Newark
River Trent
R. Witham
River Witham
THE WASH
DERBY
Grantham
WITHAM
Fakenham



Oswald Lindley, del.

London: Edward Stanford, 6, Char



d, 6. Charing Cross.

And that the nature of the defence to be maintained, so suitable to the genius of the English people, requires the training of an efficient body of artillery of militia.

WORKS OF REFERENCE.

Adair, Colonel, A.D.C.:
Militia of the United Kingdom, with maps. 1855.
National Defences. Cambridge Essays. 1858.
Bainbrigge, Capt., R.E.: Prof. Papers, Vol. IX.
Birch, Capt. T. F., R.E.: Memoir on the National Defence of England. 1808.
Burgoyne, Gen. Sir John, Bart. R.E.: Probable Results of a War with France. 1844.
Calvert, General Sir Harry: Journals and Correspondence.
Decker: The three Arms. Translated by Major Inigo Jones, 11th Hussars.
Fergusson, Mr.: Perils of Portsmouth, &c.
Fyers, Capt., R.A.: Defensive Resources of Great Britain. 1852.
Gordon, Hon. Col.: National Defence.
Graham, Lieut.-Col.: The Art of War. 1858.
Haverfield, Capt. 1st Durham Mil.: Suggestions for Permanent Staff, &c.
Haggard, Capt. East Norf. Mil.: Militia as a Constitutional Force.
Jebb, Col., R.E.: Manual for the Militia. 1853.
Jervis, Capt., R.A.: Manual of Field Operations. 1852.
Lewis, Major-Gen., R.E.: Prof. Papers, Vols. II. and IX.
Lloyd, General: On the Invasion and Defence of Great Britain and Ireland. 1808.
Mémoirs par le Géneral Lloyd, traduit par G. Imbert. Limoges, 1801.
Observations sur le Mémoir du Géneral Lloyd. Par Grobert, Chef de Brigade. 1803.
Macdougall, Sir Duncan, 79th Reg.: Organisation of the Militia, &c.
Macdougall, Lieut.-Col.: The Theory of War. 1858.
Mansfield, Col. 53rd Reg.: The Militia Force. 1854.
Maurice, Baron: The National Defence in England. Translated by Capt. J. C. Addison, R.E. London, 1852.
Napier, Lieut.-Gen. Sir C. J.: Letter on the Defence of England. 1852.
Twemlow, Col. Bengal Art.: Tactics and Strategy. 1855.
Westmacott, Major, R.E.: Notes upon the National Defence. 1854.

Evening Meeting.

Monday, 31st May, 1858.

COLONEL MATHESON, in the Chair.

The Chairman announced that ten Members had joined the Institution since the 17th of May.

ANNUAL SUBSCRIBERS.

Logan, T. Q., Dep. Insp.Gen. of Hospls.
Toulmin, A., late H. E. I. Co. Sea Service.
Hutchinson, A. H., Lieut. R.A.
Ashley, Lord, Lieut. Antrim Q. Royal Rifles.
McIlree, J. D., 1st Class Staff Surg.
Lambert, Rowley, Captain R.N.
Williams, C. H., Lieut. h. p. R.N.
Williams, E. A., Captain R.A.
Gilmour, C. D., Lieut. R.A.
Morse, H. B., Dep. Commy.-Gen.

DONATIONS.

Robinson, W. F., Captain Hon. Art. Company . . 10*s.*

LIBRARY.

Greenwich Observations for 1856. Large 4to. London, 1858.
By the Lords Commissioners of the Admiralty.

A Chart showing Dampier's Voyage round the World, 1699-1700.
By the Lords Commissioners of the Admiralty.

MUSEUM.

A Sepoy's Cap, brought from India about the year 1795. This figured cap appears in the back-ground of a full-length Portrait of the late Duke of Wellington. *Mr. White, firm of Hawkes and Co. 14, Piccadilly.*

Specimens of Elongated Rifle Shot for Vertical Fire; Sabot made of Concave Pasteboard Wads; Safe Means of inserting Percussion Appliances in Rifle Shells for Rifle Cannon; Gossamer Seamless Cartridges; Percussion Blasting Cartridge; Artificial Stone Rifle Shot; Improved Cordage; Implement for firing Cannon without a Vent; Fog Alarum Signal. *Captain J. Norton.*

A piece of a Scarf cut by the donor from off the body of a Circassian Chief who led the Russians in a sortie from Sevastopol against the British line of entrenchments on the night of 24th March, 1855; it is interesting as showing where the shot struck him, having been cut from the portion immediately above the heart.
Presented by F. De la Chaumette, Esq.

Twenty-nine Sets of Bullets, some before firing and some after.
Presented by Lieut.-Col. E. C. Wilford.

Model of his plan for Reefing Topsails from the Deck.
Presented by H. D. Cunningham, Esq. R.N.

Model of Boat with Lowering Apparatus.
Block for ditto.
Presented by Mr. Clifford.

ON THE MILITARY AND NAVAL USES OF VERY LARGE SHELLS, AND THE COMPARATIVE POWERS OF SHELLS IN RELATION TO DIAMETER.

By Robert Mallet, Mem. Ins. Civ. Eng. F.R.S. &c.

Some apology may seem due from a civil engineer, addressing an assembly almost exclusively military, upon a subject apparently of a purely military character. I am sure, however, that every scientific soldier or sailor will admit a certain common ground betwixt the domains of the military and the civil engineer, in which the constructive and practical knowledge of the latter, directed by science, is applicable to some portions of the art of war, without infraction of the undoubted truth, that experience, and the tact which that alone can give, must ultimately decide the adaptability and value of every suggestion or invention, whencesoever emanating, as applicable to warfare.

Some of the earliest events of the late Russian war proved that our weapons of direct and vertical fire were inadequate, as against the great modern extensions of casemated batteries, of the heaviest ashlar granite masonry (frequently mounting several tiers of guns), or of earthwork ramparts; that the 68-pound shot and the 13-inch shell were overmatched in both cases. A new projectile was demanded with momentum more proportionate to the inertia of those enormous defensive masses, whose line of fire should be directed against the weakest direction of those works in masonry; whose range should equal, if not exceed, the effective fire of the heavy calibres arming their embrasures, and whose explosive power should be equal to dislocate and scatter the massive material, whether of stone or earth, of these Russian works.

Having witnessed somewhat of the effects produced at the siege of the citadel of Antwerp by the 24-inch shells thrown by the French in 1832, and observed the causes of their comparative failure there, I investigated pretty fully the whole question of the relative powers of demolition of shot and shells, and the relations of that to calibre and weight, and soon satisfied myself, that in a shell of very large diameter, would be found a projectile possessing powers which no works in existence, or constructed by any known methods, would be

capable of resisting. I determined that the minimum size for a shell fulfilling the required conditions should be 3 feet in diameter. The possibility of constructing mortars capable of throwing shells of that size, and, admitting also of transport with facility, then came before me, and having satisfied myself of its practicability, I laid a proposition for the construction of such mortars and shells before Government in February, 1854, in a memoir, in which I gave a *resumé* of the investigation I had made of the powers of shells in relation to size.

The Ordnance authorities of that day reported decisively against my proposition. They admitted (what, indeed, my own investigation had left without the power to doubt) the surprising results as to increment of efficacy and power of these very large shells, but they doubted the possibility of constructing a mortar to throw them; and, in any case, declared the construction of the mortar proposed by me, viz. formed in several separate pieces, (for facility of transport,) so hazardous as to be unworthy of trial.

Fortunately I was enabled to explain my views, personally, to His Royal Highness the Prince Consort, and to Lord Palmerston, and to the enlightened views of both, and to the courageous support of the latter, is owing the trial of these experiments, by which it has now been proved that these 3-foot shells, weighing above a ton and a quarter each, can be thrown to a horizontal range of at least two miles; that a mortar for their projection can be made, and constructive data have been now secured by actual experiments, precious in importance, and upon which other mortars of like construction may be hereafter made, whose proportions shall admit of still greater range, and if desirable, even exceeding that of any known ordnance.

In the following Lecture then I propose to recapitulate briefly some of the results of my investigation of—

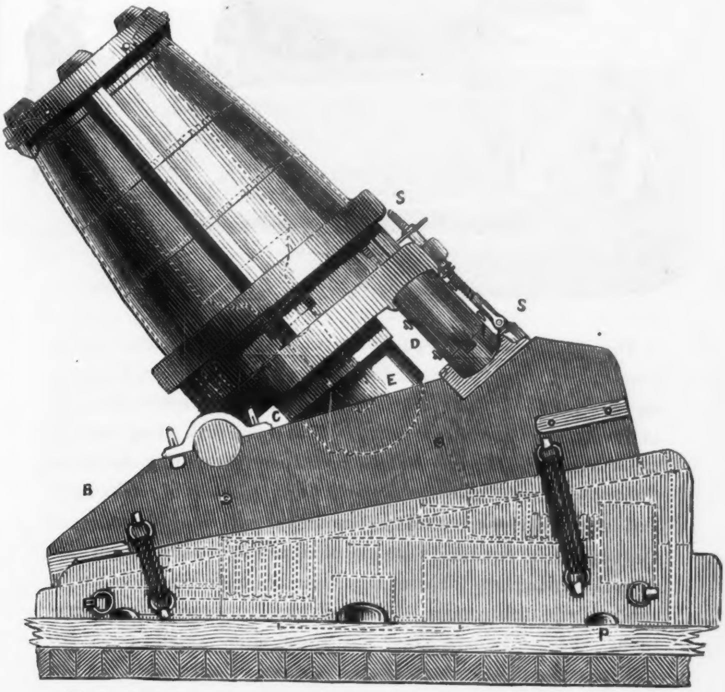
1°. The general relations as to power, of shells in proportion to calibre, and to point out the proportionate power of these 3-foot shells, as compared with the 13-inch, the largest at present in common use in European armies.

2°. To describe the construction and the form of the 36-inch mortar by model, sections, and photographs; and

3°. To point out some of the peculiar purposes to which these very large shells are specially applicable, with the methods of placing in battery the large mortars.

Much misconception prevails, even amongst military men, as to the objects proposed for these great shells. Let it be therefore clearly understood, that 3-foot shells are not a missile for use against troops, but an instrument of demolition and destruction as against works. *The means, in fact, of transferring to any point within range of the besieger, an ignited mine, whose penetrative power shall bury it to the required depth before its explosion.*

The 36-inch mortar is shown in lateral elevation in fig. 1, and in front elevation in fig. 2.



The under bed or slide is shown in fig. 1, but in fig. 2 omitted. The mortar being shown (as actually photographed at Woolwich) on the sloping platform.

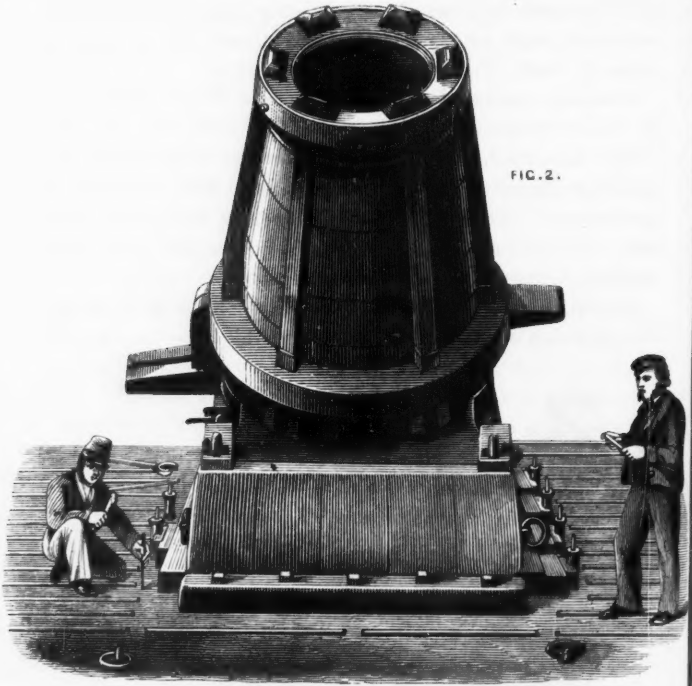


FIG. 2.

This construction is peculiar in two principal respects, viz. its formation of wrought iron, and in separate hoops or rings, "shrunk on" in succession upon each other, to make up the entire thickness of the chamber and of the chase, so that each shall grasp that interior to it with a certain initial tension, and thus bring the whole thickness of metal into equable strain at the moment of discharge;* and the division of the whole mortar into six principal segments, so that it may be separated into pieces of a manageable weight and form for transport. These pieces are put together with simple rabated well-fitting joints, which are found practically to be gas-tight.

The weight of the whole mortar is about 52 tons, including the

* The theory of this is given, in the latter chapters and notes of "Mallet on the Physical Conditions involved in the Construction of Artillery." 4to. London, 1855.

bed. The heaviest single segment is the base, which weighs about 11 tons, the chamber-piece about 8 tons, and the segments of the chase from 6 tons, to about 2 tons respectively. When put together, the segments are united by six longitudinal bolts, with the muzzle ring, and base. The chase is 2⅓ calibres long nearly. The chamber is deep and narrow, and was made to hold 120 lbs. of powder; a quantity much larger than at all necessary. The vent is at the rere in the metal of the chase, on the level of the spherical cup or seat of the shell, and the powder is fired by a Bickford fuze, passed in through and under the shell to the powder—or if desirable by the galvanic wire. It is thus fired from the top of the chamber, in order to give it longer time to burn, for which purpose also the charge is placed in separate 10-pound bags of flannel, in one of which the end of the fuze is choked, and which fires the rest.

The mortar is capable of elevation or depression 10°, or from 40° to 50°, angle of elevation. It is sustained upon the elm timber bed by two lines of support, both transverse to the plane of projection, viz. a trunnion of 8 feet long in advance of the mortar, and a pair of beech chase wedges in rere, which are provided also with an elevating screw merely to ease the weight of the mortar off the wedges, if change of elevation be required, and to act as a bridle, and prevent any chance of the mortar canting forward by elastic reaction of the bed or platform after recoil.

The mortar-bed has been temporarily placed, directly upon a timber platform of two thicknesses of whole fir balks about 24 feet square, sloped 12° upon common earth and sod work, which has been found readily to stand the recoil; but my original designs provided for an under bed or slide upon which the bed is to be placed (whether for land or sea service), and which admits a certain amount of recoil in the plane of its upper surface (inclined 12°); but there stops it against large buffer-blocks of vulcanised caoutchouc, placed between the side pieces of under bed, which is itself secured to the platform by a strong central axis or pin of wrought iron about 8 inches in diameter, so as to limit *its* motion to one in azimuth upon the platform or deck, which are then laid horizontally. The shells are loaded by means of a light Derrick crane, with perfect facility, at the rate of four rounds per hour, which a little practice,

the gunners themselves state, would easily increase if requisite to six rounds per hour, thus giving as rapid a fire as is usual from a common 13-inch mortar. Transport by land of the several pieces is performed on the common devil carriage, and even in the case of the heaviest piece, the base (whose weight, however, is less than that of two 68-pounders), and over the soft and unfavourable ground of the Plumstead Marshes, was not found to be attended with any real difficulty.

Time forbids more details as to the construction of this mortar, or entering at all upon description or discussion of the peculiar principle of increased strength involved in the building up the whole thickness in successive lamina or rings with initial tension, for which I must beg to refer to my work upon the Construction of Artillery, first published in June, 1855. I therefore now proceed to a brief comparison of the powers and effects of shells in relation to their size.

But first let us pass in rapid review the history of shells, especially in relation to size, from early periods up to the present time.

From the middle of the seventeenth century, when Malthus, an English gentleman (and apparently not a soldier), having learned the practice of throwing shells in Holland, and perfected the system for the French, being the first to throw them in France, at the siege of La Mothe, in 1643, up to the present time, but very slight modifications appear to have been made in the diameters of shells in established use throughout Europe. Borrowed from the old French standard of a Paris foot in diameter, the 13-inch shell appears to be about the largest employed in any service. England, Hanover, Spain, Russia, and Sweden, use shells larger than those of the other European powers, and those of Russia and Sweden a little exceed all the rest in size.

Hollow projectiles are said to have been used on the earliest recorded occasions; at Naples, 1495; at Padua, 1509; at Heilsberg, 1520; at Mézieres, 1521; at Rhodes, 1522; and at Boulogne, 1542; and were made of wrought-iron, of bronze, of alloys of lead and tin, and finally of cast-iron, as now. Although limited, in the seventeenth century, to the existing sizes, the preceding century had witnessed the use of bombs (*cominges*) of a very much larger size. At Boulogne, as early as in 1542, shells of 19 inches, French; at Berlin, in 1683, mortars and shells of 1100 lbs. weight existed; at the Bombardment of Genoa, in 1684, shells of 1,320 lbs. were thrown; and even as late as 1745, at the siege of Tournay, the French threw shells of 18 inches, weighing 550 lbs. See Valturius, "De re Militari," Paris, 1534; Gentilini, "Instruttione de Artiglieri," Venice, 1598; Biringoccio, "Pirotechnia," Venice, 1550; and Collado, "Practica Manuale del Artiglieria," Milan, 1641.

The French found, on taking Algiers in 1830, numbers of shells weighing nearly 900 lbs.; and the Swedes, in 1642, used shells of 462 lbs. weight, and

holding 40 lbs. of powder; and, in most arsenals of Europe, an old shell or two from 16 inches to 18 inches diameter, may be found preserved as a curiosity.

With the exception, however, of the attempt made by the French in 1832 to construct a 24-inch mortar, and apply it at the siege of the citadel of Antwerp, no attempt seems to have been made in recent days to realize the vast increase of power that such large shells must confer; scared, apparently, by their former abandonment, which Antoni, ("Uso dell' Armi da Fuoco," Torino, 1780) states arose from the awkwardness of loading, which prevented more than one discharge in forty minutes, and from the great cost of the manufacture of such shells in the condition of iron-founding at that time.

The "Monster Mortar" of Antwerp, as it was called, was designed by Colonel Paixhans, and cast at Liege by direction of Baron Evain, Minister of War. Its form was crude—a mere cylinder, embedded in a mass of timber. The dimensions of the mortar were—

	Inches.
Total length	59
Diameter outside	39·5
Calibre	24·5
Length of chase from top of chamber	27
Depth of chamber	19
Diameter of chamber	9

When afterwards burst at Braschaet, the casting was found to present those defects which are inevitable to huge masses of cast-iron suddenly varying in dimensions.

The weight of the mortar was 14,700 lbs.; that of its bed, 16,000 lbs.; the weight of the empty shell was 916 lbs.; the charge, 99 lbs. of powder; giving a weight for the shell in flight of 1,015 lbs. The chamber of the mortar would hold 30 lbs., but about 12 lbs. of powder were found sufficient to throw the shell 800 or 900 yards. When brought into position against the Citadel, at about 1,000 yards range, after one or two preliminary trials, it was found that a shell could be fired about every 40 minutes, the loading being performed by an awkwardly constructed balanced lever or "chevalet." But few shells, however, were fired — not above 20 in all having been provided, which had only an *average* thickness of about 2 inches, and were found so weak about the "culot," or bottom of the shell, that they rarely resisted the shock of projection, and burst near the mouth of the mortar, whilst the fuzes of others seemed to be bad. The very few, however, that were fired successfully, produced effects so formidable, that the capitulation, which took place before the breach was practicable, and within a few hours from the explosion of the first, was assumed to have been precipitated by the persuasion of the Governor, General Chassé, of the impossibility of maintaining the fortress under their continued fire.

One of these shells fell within a few yards of the principal powder-magazine, but, it is believed, did not explode; had it fallen on the magazine, which was presumed bomb-proof, it was the universal opinion of military engineers present that it would have pierced the arch. The magazine contained above 300,000 lbs. of powder: its explosion, therefore, as in the case of the magazine accidentally blown up at St. Jean d'Acre, would have settled the contest at a blow.

This mortar, than which a more unwieldy and unmanageable instrument could scarcely be conceived, was afterwards burst in experimenting with it on the Heath of Braschaet. After having been fired with various charges, from above 40 lbs. downwards—by which it was ascertained that less than half this quantity sent the shell as far as one greater—a charge of only 9 kilo. = 19·845 lbs. of powder, burst it.

The unsatisfactory practice of these shells at Antwerp, as the author had opportunity of knowing, arose from defects of construction, and from the extreme awkwardness of the design of the mortar-bed, and of the means employed for handling and loading these heavy shells. Some experiments were made in 1833 at Braschaet, which proved that these shells, thrown a range of about 3,000 feet, at 45°, penetrated into the solid earth of the Heath from 7 to 8 feet, and that the explosion of the bursting charge of only 55 lbs. produced a crater of about 20 feet diameter. The splinters averaged from twelve to fourteen, and were thrown an average distance of about 100 feet.

This appears to be the largest scale upon which any attempt to throw shells, of a size to be properly termed "Transferable Mines," had been made up to 1854.

A general comparison of the powers of shells in relation to dimensions and weight may be methodised under the following heads:—

1st. Horizontal range.
2nd. Penetrative power.
3rd. Explosive power.
4th. Total power of demolition.
5th. Fragmentary missile power.
6th. Accuracy of fire, or deviation.
7th. Comparative cost for equal effect.
8th. Moral effect.

Upon the 2nd and 3rd conjointly, viz. on the united power of penetration and explosion, depends the crater excavating power of the shell.

With similar spherical shells, if σ be the specific gravity of the iron, D and D_i the external and internal diameters, then the weight of the shell

$$P = \sigma\,(\pi\, D^3 - \pi\, D_i^3),$$

and p being the weight of the projecting charge due to any velocity, V the velocity of projection of the shell will vary reciprocally, as $\sqrt{P}$; and the *vis viva* of the shell at any point of its flight being $\frac{P}{g} V^2$; the accumulated work deliverable by the shell at any point in its descending path is $\frac{1}{2}\frac{P}{g}\,V^2 \times \text{cosin}\ \theta$; θ being the angle which its actual course makes at that point with the vertical.

The limit to V is the terminal velocity of descent in air, which, however, is never reached in the range of any large shell in its descending path.

As R the horizontal range (when not in a resisting medium) is

$$R = \frac{V^2 \times \sin 2\,e}{g}$$

e being the angle of elevation, when e and p are the same, R might be supposed to vary as $D^3 - D_i^3$. In air, however, the horizontal range increases faster, for the energy of movement is in proportion to $D^3 - D_i^3$; but, where V is constant, the energy of resistance of the medium is proportioned only to D^2. And, in addition, it is extremely probable that *large* spheres are opposed in their movement through air at high velocities by a resistance less *per unit of section* than small ones.

The explosive power depending simply on the weight of included powder is, of course, proportionate to D_i^3.

Not pursuing further the general investigation, however, let us limit ourselves to the comparison of the power of the 13-inch shell (the largest in use), and the 36-inch shell.

The weight of a 13-inch shell in flight varies from about 180 lbs. up to 200 lbs. The Antwerp shell, therefore, weighed as much as about five-and-a-half 13-inch shells.

The weight of iron in the empty 36-inch shell averages 2,481 lbs., and the weight of bursting powder, supposing the internal cavity full, is 480 lbs.—so that the total weight of the 3-foot shell in flight is 2,966 lbs., or about $1\frac{1}{4}$ tons.

From what has been already stated, it is obvious that the penetrative, explosive, and missile powers of *similar* spherical shells increase with the weight of iron and of powder, or as D^3 simply; but when the diameter of the shell is *very* largely increased, all the powers upon which its efficacy depends, increase in a still higher ratio, including even the horizontal range.

Assuming the angle and altitude of projection (e and V) to be the same, and hence the velocity on reaching the earth, neglecting the resistance of the air, the penetrative power of the 3-foot shell as compared with the 13-inch shell will be directly as their weights, or as, say

$$2966 : 200$$

or nearly as 15 to 1 in favour of the large shell, supposing the surfaces of impact the same. In imperfectly elastic solids, such as masonry, brickwork, earth, &c., which yield partly by rupture and partly by compression and change of form, the resistance to penetration immediately after impact may probably vary something between the diameter and its square, or between D and D^2. The proportionate penetration also will vary with the nature of the resisting material: and the more compressible this is (such as the compacted earth-covering of casemate or magazine arches), the greater will be the advantage of the larger and heavier shell over the light one. Experiment now has shown that I was quite safe (in the absence of data) in originally assuming that the penetrative power of the 3-foot shell would be at least six-fold that of the 13-inch shell. The actual penetration into the solid earth of the practice range at Woolwich, after dry weather of long continuance, has been found to exceed 18 feet, even at the moderate horizontal range of about 2,000 yards.

Experimental data are wanting to enable any precise calculation to be made for any given material. A 13-inch shell penetrates solid sand and earth about 2·5 feet.* The Antwerp shell penetrated such earth about 7·5 feet, or three times the depth, it weight being about five and a half times as great.

The 36-inch shell might, therefore, be presumed to penetrate at least 15 feet

* Aide Mem. de l'Artil. Française.

into compact earth; and, upon exploding, to excavate a crater of 40 feet in diameter; and as a depth of about 6 feet in earth has been found to give the maximum excavation or crater, from the explosion of a 13-inch shell, so this depth of 15 feet would give about the same result for the 36-inch.

The 13-inch shell, however, usually penetrates into compact earth about 4 feet.* Taking that of the 3-foot shell at 18 feet, we are enabled to calculate their relative powers of crater excavation. Let us assume the bursting-charge in each proportioned at these depths to excavate three line craters only. Then the solid contents of the paraboloid blown out is

$$S = 0{\cdot}5\,\pi\, y^2 x.$$

y being the ordinate, and x the absciss of the curve of vertical section. This gives

For the 13-inch shell . . . 228 cubic feet;
For the 3-foot shell . . . . 20610 cubic feet

of earth removed from the crater, or above 90 : 1 in favour of the large shell; heir total weights respectively being, as before stated, only as 15 : 1.

Thrown at a low velocity, the resistance of the air, in flight of shells, is perhaps directly proportionate to the area of their great circles, or to D^2; or, in this case, again comparing the 13-inch and 36-inch shells, as 169 : 1296, or as 1 : 7·66, or nearly as 1 to 8.

The energy of motion, however, or their respective powers at equal velocities to overcome this resistance, is as their respective weights, or as 200 : 2966, or as 1 : 15 nearly.

The retarding to the moving forces, therefore, in the two shells are as 8 : 15, or nearly 2 to 1 in favour of the large shell.

It is certain, therefore, that much smaller proportional charges of projection may be used for equal ranges with these large shells; and that, with equal projectile charges, the velocity of descent from the trajectory will be much greater.

The projecting charges for 13-inch shells varies from 15 lbs. to 20 lbs., the extreme range at 45° being 4,700 yards, or 2·10 miles.

Assuming equal horizontal ranges, at equal elevations, as due to equal velocities, the charges for projecting different shells with equal velocities must be in proportion to the work done in each case; or as

$$MV^2 : M'V^2$$

or as

$$M \text{ to } M' - \text{when } V = V'.$$

This would give a projecting charge at maximum of nearly 140 lbs. for the 36-inch shell; but, owing to the much higher heat developed, the proportional effects of very large masses of powder are greater than those of small bulks. Less than one-half of this charge would, therefore, probably be sufficient in practice for every requirement.

As the relation between aërial resistance and momentum, however, has been shown to be as nearly 2 to 1 in favour of the 36-inch shell, there can be no doubt that, with a proportional charge, a range very much above that of a 13-inch shell could be obtained, and that an extreme horizontal range of from three to four miles might be anticipated. Such extreme ranges, however, are not the important

* Aide Mem. de l'Artil. Française.

question as respects these large shells, whose most valuable and effective uses would probably be found at much less distances, or within a range of 1,000 to 1,500 yards.

The truth of the assumption here made as to the greater proportional effects of large than of smaller projecting charges has been abundantly proved by the experiments with the 3-foot shells at Woolwich, as may be seen by examining the practice tables hereafter given.

For example. It is known that with a projecting charge of 20 lbs. the 13-inch shell of 200 lbs. weight is thrown about 4,400 yards. In the experiments of October, 1857, a 3-foot shell was thrown nearly 2,700 yards with a projecting charge of 70 lbs., its actual weight being 2,548 lbs.; or

$$\text{36-inch shell, } \frac{2{,}548 \text{ lbs.} \times 2{,}700 \text{ yds.}}{70} = 98{,}280$$

$$\text{13-inch shell, } \frac{200 \text{ lbs.} \times 4{,}400 \text{ yds.}}{20} = 44{,}000.$$

The proportional effect is thus more than 2 : 1 in favour of the large shell.

This difference in amount of available work from fired powder, enormously exceeding anything, I believe, ever before attained with any projectile, is due chiefly to three causes—

1°. The higher temperature of the fired powder in the large mortar, and the small proportionate loss of its heat by convection into the cold sides of the mortar chamber.

2°. The diminished proportionate windage, which is only ·006 of the diameter of the 3-foot shell, but is ·012 of the diameter of the 13-inch shell, or the lunaric areas between mortar and shell, on which the loss of force depends as the squares of these numbers, or $\frac{1}{32 \cdot 7}$ in the 13-inch, and but $\frac{1}{51 \cdot 9}$ in the 36-inch mortar, or little more than one-half.

3°. The greatly reduced aërial resistance to the large shell.

Before dismissing the subject of the penetrative power of these large shells, one more remark may be made.

In the destruction of buildings, &c. it is all important that the shell before explosion should enter the interior. This always involves questions of *inertia*, in which the greatness of the *mass* of the falling shell, as opposed to the *mass* of the body to be moved or pierced, whether arch, floor, or solid earth, are elements. It is almost inconceivable, how vastly greater will be the shaking and dislocating effects upon structures, of a mass falling on them of 1¼ tons weight, as compared with the insignificant weight (200 lbs.) of a 13-inch shell.

A 13-inch shell with difficulty pierces through a well-made brick arch, of moderate span, and three bricks thick. It seems probable that not one of the casemated forts of the Russian fortresses could sustain the shock of the fall of a 36-inch shell, without total dislocation.

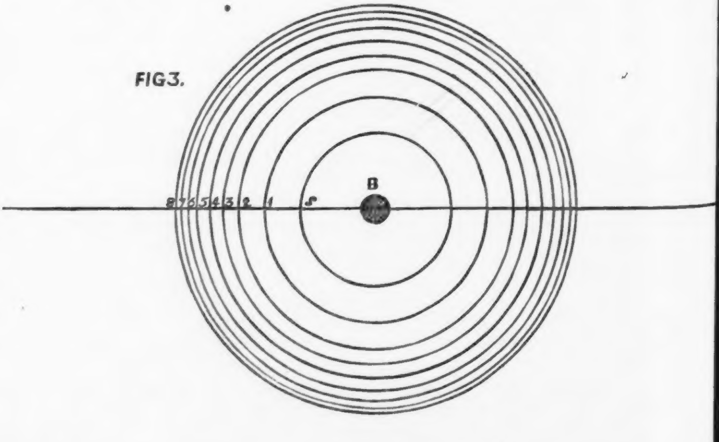
Authors on military architecture state that vaults of masonry of 40 inches in thickness are bomb-proof, and the tables of fire, give a penetration into masonry of 13-inch shells, at extreme ranges, of only 3 or 4 inches. At the siege of Tournay, in 1745, forty or more such bombs are said to have fallen upon the magazines, without doing much injury. One element, however, seems to have been omitted by all authors who have treated of this subject, namely, the span of the arch, the weak-

ness of which, to resist the shock of shells, must increase more rapidly than the span for equal depth of voussoir, and very much must depend upon the character as to weight, elasticity, and crushing resistance of the material of the arch. A heavy, moderately soft, tough brick arch, well jointed and bonded, will probably offer a much greater resistance, for given dimensions, than one of hard, elastic stone, unless the latter be in very heavy blocks.

The explosive power of any shell being, as stated, directly proportionate to the weight of powder it contains, it might seem at first, that the destructive effect of the explosion in shaking and levelling buildings, &c. will have a focus or area of action in the like proportion. The explosion of a shell may be regarded, at the first moment, as equivalent to the sudden creation of a sphere of elastic gases, equal to about one thousand times the volume of the contained powder. This produces, by its sudden expansion, a blow or pulse upon the surrounding air, which is propagated outwards, in all directions, in spherical shells or waves, moving with uniform velocity, which is about equal to that of sound in air, but with a continually decreasing range of pulse or amplitude of oscillation, as the distance from the point of explosion increases. The quantity of elastic matter in motion, at any moment after the explosion, must, in accordance with the general mechanical law of the conservation of *vis viva*, be equal to that in the original generating sphere, to whose cubic area that of every subsequent spherical shell must be equal also at the instant of equal density. The surface of each spherical shell increases in the ratio of R^2, and if the entire phase of the wave (*i. e.* the oscillation to and fro) be $2a$, the impulse at any point of the surface of any spherical shell, at the distance R from the origin, is proportional to $\frac{1}{2a\,R^2}$.

It is important to grasp completely the mechanics of wave movement, upon which a true comprehension of the explosive effects of shells depends, not only in the simplest case, as when exploded in mid air, but also when exploded under earth or other imperfectly elastic material; and the same laws are applicable to mines, &c.

FIG 3.



If B (Fig. 3) represent in volume and position, in an elastic medium, the exploding bomb, the gases of its explosion, expand within the extremely short time occupied by the burning of the powder into the sphere, whose radius is BS, and have at this assumed instant some particular density δ, equal to or greater than that of the medium of propagation. The wave, consisting of one normal and two transversal vibrations, moves outwards in the successive spheric "couches," S-1, 1-2, 2-3, 3-4, 4-5, 5-6, 6-7, 7-8, &c. and at each radial distance, 1, 2, 3, 4, 5, 6, 7, has the same density as at S: *i. e.* those imaginary spheres, whose sections the circles represent, are taken at the same phase of the wave in its passage outwards, and in a perfectly elastic medium the explosive properties of shells are derivable from the general equation of waves.

$$v = a \text{ cosine } \left(\frac{2\pi}{\lambda} (x - \alpha t) \right)$$

where v is the velocity at any point, a^2 the intensity, λ the amplitude of the wave, α the velocity of propagation, x the absciss, and t the time.

At the point of equilibrum $v = a$ and the *vis viva* of any particles Δm during the wave's oscillation is proportional to Δma^2, and the whole work of the wave to $\frac{1}{2}\Delta ma^2$. The volume in simultaneous movement remains the same throughout the course, and the velocity of propagation α is constant also. Therefore, the amplitude λ (of the normal wave considered alone,) or the intervals 1-2, 2-3, 3-4, &c. decrease with R^2, and this is the measure of the *overthrowing power of the explosion* of the shell (altogether *distinct from the impulse of any solid fragment* or splinter impelled).

The *effect* upon a given solid object, however, depends also upon its form, density, position, &c., with which we are not here concerned.

The shock, or overturning power of the elastic wave, or, what is the same, the energy of the explosion in overthrowing similar objects, is at every point around (above the earth's surface) inversely proportionate to the square of its distance from the focus of explosion. In fact, it follows the law of light and sound in air. But the amplitude of the wave is originally proportionate to the weight of powder exploded; a determinate extent of oscillation or amplitude λ, is necessary to overturn or destroy any given object, whether it be to overturn a wall or to break a window, therefore, any such object will be overthrown by unequal quantities of powder, at distances greater as the quantity is greater. This is the power of *demolition in any radial direction* round; but this power acts alike in all radii, or in a circle having this for its radius, and whose area is proportionate to R^2. The *total power of demolition*, therefore, of any shell varies directly as the square of the weight of powder exploded.

Comparing, then, the 13-inch and 36-inch shells, the total powers of demolition are as $12^2 : 480^2$, or as 144 : 230400, or as 1 : 1600; and equal demolition will take place at radial distances from the point of explosion, greater in the ratio of 40 : 1. Nor can it be concluded from this, that the extent and character of demolition would only be equal to that of forty 13-inch shells; for it is obvious that the explosion of the 36-inch shell will be capable of overturning or destroying objects which the explosion of a 13-inch shell, or of any number of successive 13-inch shells, however great, could never move at all, however near to the explosion.

If the shell be exploded after it has been buried, the principles just stated apply

(with certain modifications) to the dislocation and shaking down of buildings and all objects upon or beneath the surface by the pulse-blow, analogous to the shock of an earthquake, communicated to the imperfectly elastic medium, earth, &c. in which the explosion occurs. This is obviously a distinct consideration, from the effects of overthrow and removal, produced by the eruption of the mass of material finally blown out of the excavated crater, and the latter cause of dislocation and overthrow would be operative, even were the shell buried to such a depth that its explosion was smothered down, and no crater formed at all.

It may just be noticed in passing, that this application of undulatory mechanics to the explosive properties of mines and shells (which, I am not aware, has been previously attempted,) indicates that the usual empirical formula for the charges of mines and craters of excavation,

$$x = \frac{c\,L^3}{l^3}$$

x being the charge required, L the given line of least resistance, and l the experimental line due to c, a constant determined for it, cannot be theoretically true, and must diverge more and more from truth, as the medium in which the crater is placed is more compressible, less elastic, and the absolute measure of the charge greater. In rock, and with small charges, however, it may be practically sufficiently reliable.

The missile power of the shell as against fixed objects (and such shells are not intended to act against troops, but against the soil, material, buildings, and other essentials of fortified places, or against shipping) depends upon the total weight of fragments, and on the distance to which they are projected; the latter will vary about as the $\sqrt{w}$, the weight of exploded powder, for a given weight of shell.

Hence, in the 13-inch and 36-inch shells, as $190 \times \sqrt{12} : 2486 \times \sqrt{480}$, or as 665 : 54443, or as 1 : 81. In this respect, therefore, the large shell is above eighty times as destructive as the largest now employed.

The fragments of 13-inch shells are stated sometimes to range nearly 2,500 feet (Piobert).

The number of fragments with similar proportioned shells would probably be the same, about 12 or 14; but if the 36-inch shell were somewhat thinner in proportion, the greater energy of the included bursting-charge would probably produce a greater number of fragments. A few *large* fragments, will, however, be most advantageous with these large shells. And here again, it is to be observed, that for the same reason that one heavy shot may batter down an object upon which any number of much lighter shot would produce no impression, so the heavy fragments of the 36-inch shell will go through or batter down walls, &c. upon which those of 13-inch shells would have no effect whatever; besides which, the largest of the fragments of the 36-inch shells will often be flung to distances vastly greater than the average here assumed.

The fragments (for we cannot call such massive pieces of cast iron splinters) of such shells as these should always be held subordinate to the crushing and penetrative effects of the mass of the iron shell, and to the effects of explosion and of demolition of their included powder: and hence, in actual practice, the thickness of the 3-foot shell should be varied with reference to the work it is called upon to perform. If this be the crushing through the earth-cover and arches of casemates or magazines, the thicker and heavier the shell the better— as weight

and velocity of descent to give momentum are the first requisites. If, on the contrary, demolition, crater excavation, crevassing, and shaking down buildings and houses, and making a fortified place, devoid of all comfort and cover, then the thickness and weight of the 3-foot shells should be reduced to the lowest point of safety that the stroke of the projecting charge necessary to send them the required range will admit, without endangering the fracture of the shell thereby, in or near the mortar; and the largest possible cavity should be left available for powder. These are the two limits of variation as to weight.

Let this important and striking fact not be forgotten, as already actually achieved with these shells—that, since it has been demonstrated, that common spheric 3-foot cast-iron shells of a ton and a quarter weight can be thrown two miles, and that a mortar can be made to throw them, *there remains no longer a bomb-proof building or fortress in the world.* The first such shell actually thrown at Woolwich, announced the existence of a new projectile, against which the old and known methods of bomb-proofing are powerless; and our military engineers will, I would respectfully add, do well to consider fully, the consequences of this fact, not only with reference to the use that future offensive warfare will inevitably make of this power given it, but also as respects the future safety of our own coast defences and fortresses.

Enormous as are the powers of impact of a 3-foot shell, descending with a blow comparable to a pressure of some 800 tons, acting for a fraction of a second, and utterly powerless before its fall, as are all existing arches or splinter proofs, the problem of new construction, and wholly changed methods of bomb-proofing, though difficult, is still within the grasp of our engineering knowledge and skill. A few years will assuredly call for its exercise, and put it to the proof.

Amongst the many objections urged against these shells were, that they would be so unwieldy to handle, that but one round an hour, if so much, could be expected. We have seen how one day's trial disposed of this, and proved that, with proper tools, these ton and a quarter shells, could be fired four rounds an hour, or, if desired, as fast as 13-inch shells. Again it was said, that the explosion of the mortar would be so tremendous that it could not be borne at any reasonable distance. The fact has proved that, with charges sending the shell nearly two miles, the shock and jar of the mortar's explosion is less distressing upon ear and frame, than that of a 68-pounder fired from a casemate; it is very little louder, and not more distressing, than that of a common 13-inch mortar; and lastly, that from the supposed unwieldiness of the shells, from assumed irregularities in their casting, and other imaginary causes, accuracy of fire would be almost impossible, and that a larger amount of deviation than with 13-inch shells must be looked for.

The following lines were penned upon this part of the question before a shell had ever been fired:—

"It appears from the French tables of actual practice in service, that the mean deviation of 13-inch shells, at elevations of 45°, and extreme ranges (4,630 yards), is about 102 feet in range, and 152 in diameter.

"It has also been found that the probable accuracy of fire with solid projectiles, point-blank, increases in the ratio of the square of the weight for equal density, and directly as the density of the projectile. This should also apply to the causes of deviation due to flight alone, of shells. The density of the 36-inch shell is not as great in the proportions proposed as the 13-inch shell, but may be made so. In that case the probable accuracy of fire, at equal ranges, would be as $2966^2 : 200^2$,

or as 8797156 : 40000, or as 219 : 1; or, at double the range of a 13-inch shell, the increased probable accuracy of fire would be about as 100 : 1.

"This takes no account of any causes of deviation but those operative in flight: making the most ample allowance for all others, *the accuracy of fire of these large shells must be considered at least thirty times as great as that of* 13-*inch shells.* The French tables of probability of shell-firing show, from a base of thirty years' practice, that of 100, 13-inch shells, at ranges of about 550 yards, 3·38 shells are dropped within a circle of 25 *feet* diameter; *at* 1,100 *yards range, therefore, at least* 45 *per cent. of the* 36-*inch shells fired might be expected (after due experience) to fall within that circle, or within a space less than half the breadth and one-eighth the length of a ship of the line.*

In an able Note on Mortar Practice, by Lieutenant-Colonel Lefroy, R.A., in Minutes of Proceedings of the Royal Artillery Institution, vol. ii. p. 13, the results of British mortar practice with 8, 10, and 13-inch shells are given, from which generally it appears, that at only 700 yards, but a trifle above 2 per cent. can be ensured to fall within a circle of 40 feet diameter; and from several years' practice at Gibraltar (results which Colonel Lefroy deems worthy of confidence practically) it appears that fifty per cent. of the shells fired fell within the following horizontal spaces:

Range.	Landing space.
400 to 500 yards	15 × 30 = 450 square yards.
600 to 700 yards	30 × 58 = 1,740 square yards.
900 to 1,000 yards	50 × 100 = 5,000 square yards.

Or that at ranges increasing as the numbers following, the inaccuracy increased as the numbers in the second column.

Range.	Taking the first as unity.
9	1·00
13	3·93
19	11·11

Or that in approximate whole numbers, with ranges increasing as 1, 1½, and 2, the inaccuracy of fire increased as the numbers 1, 4, and 12.

The French consider, as the result of their practice up to 1836, that only 10 per cent. of the shells fired at 650 yards can be made to fall within a circle of 21 feet diameter.

Assuming my first estimate of the increased accuracy of fire of the 3-foot shell as 30 : 1, the whole of these shells would fall within the preceding limits, or rather very much closer to the mark.

The subjoined table of the first day's practice with the 36-inch mortar, and the results of the first seven 3-foot shells ever fired, suffice to prove that my prediction of increased accuracy of fire with them was more than fully verified; and, let it be remarked, that on this occasion (being for proof of the mortar, and not a gunnery trial,) no attempt was made to train the mortar, which was fired round after round, as it stood after the preceding recoil, so that the deviations of the latter rounds are beyond question mainly due to the altered position of the mortar, and change in the plane of projection due to the previous recoils.

36-Inch Mortar and Shell Experiments made at Woolwich. Practice Range. (19 October, 1857.)

No. of Rounds.	Elevation of Mortar.	Weight of Shell.	Projecting Charge.	Diameter of Shell.	Horizontal Range.	Lateral Deviation.	Penetration of Shell.	Angle of Descent with Vertical.	Time of Flight.	Recoil of Mortar in Plane of Platform.
	°	lbs.	lbs.	Inches.	Yards.	Feet.	Feet.	°	Seconds.	Inches.
1	48·20	2,376	10	35·64	328	?	6·5	55	5 to 6	none
2	48·20	2,362	20	?	808	5	9·0	45	14 to 17	1·0
3	48·25	2,595	30	35·58	1,128	11	11·5	45	21	3·5
4	48·25	2,352	40	35·55	1,650	46	14·0	30	22	7·0
5	48·30	2,986	50	35·60	1,660	5	16·0	30	22?	11·0
6	48·30	2,604	60	35·58	2,271	78	out of reach	30	27	13·0
7	48·30	2,548	70	35·65	2,644	94	do.	20	33	15·0

The effect of increased weight upon increased accuracy of fire is very remarkable in the 5th round.

The results of farther practice on the 16th December, 1857, with average ranges of about 1,600 yards, and a strong and variable side wind, gave

Deviation to the Left.	Deviation to the Right.
$\frac{1}{3}$ of the whole fired fell 15·50 yards,	$\frac{2}{3}$ of the whole fired fell 21·75 yards,

that is to say, *the whole number fired fell, after a range of about a mile, within a surface of* 337 *square yards, or within the area of a circle of* 21 *yards in diameter.*

These results more than sustain my anticipation of great accuracy of fire with these heavy projectiles, and probably even this rude and preliminary practice with the 36-inch mortar is the most accurate that has ever been made at the same range.

In this expectation of accuracy of fire, I am gratified to find that an officer so competent by scientific attainment as Lieut.-Col. Lefroy, coincides with me. In his note above quoted he says, with reference to those 3-foot shells, "We may therefore with reason expect, in addition to an explosive and crushing effect as yet unknown, a far greater accuracy of fire than mortars have generally afforded." (p. 13.)

No one who studies the able paper of Magnus on the Deviations of Projectiles, published originally in the Memoirs of the Royal Academy of Berlin, in which the true causes of deviation due to aerial resistance, are for the first time clearly enunciated, can fail to comprehend the immense increase of accuracy of shell fire due to increasing the weight and volume of the projectile, and reducing its initial velocity. The latter, in the case of the 3-foot shell, is reduced to about 500 feet per second, for ranges of two miles, and is, therefore, probably only about one-half that of the 13-inch shell.

Upon the moral effects likely to follow the use of these powerful shells it is not necessary much to enlarge. No ordinary vaulting, no splinter-proof, no casemate exists, capable of withstanding the fall and explosion of such masses, one of which would, no doubt, sink the largest ship of war or floating battery.

A single shell, no bigger than a 10-inch or 13-inch diameter, which fell upon "Le Terrible," in 1690, pierced through her upper decks, and exploded between decks in its descent, clearing away much of the upper walls of her sides, blowing away all the poop, and killing or wounding one hundred of her men. At the siege of Namur, in 1746, a single shell, exploding after it had buried itself (in, probably, stony ground,) killed or wounded thirty men. Sir Howard Douglas ("Naval Gunnery") has given many remarkable examples, also, of the tremendous effects of shells, even of the common sizes.

No precaution, therefore, could save either town or garrison from such shells; the "rayon" of demolition of each of which would be so appalling, that it might rather be viewed as a suddenly transferred mine, than a mere shell. Wherever such a shell happened to alight in a fortified place its effects would be formidable: if even on plain ground, at some distance from buildings, it would bury itself, and its explosion dig out a formidable crater, driving the excavated contents far and wide, and rending the earth around for double the diameter of the crater. The shock of each explosion would extend so far, destroying windows, doors, and roofs, that the place would rapidly become wholly exposed to the weather. The undulation of the ground itself, produced by such explosions, would often be sufficient to throw down lofty buildings, such as columns, chimneys, obelisks, &c., beyond the actual radius of demolition.

The fuzes of such shells may best be timed abundantly long to insure the shells falling before they shall burst. The huge weight of the shell defies any attempt to remove it; and the fuze-tube should be made of a size to give a volume of fire that should defy any attempt to extinguish it, and to prevent its extinction by the shell burying itself in the ground.

To this may be added that a sustained fire from only ten such mortars, delivering each four 3-foot shells per hour, day and night, or nearly one thousand shells in 24 hours, if directed upon the works, or even the "terre plein" of a single bastion, and each shell, heaving out from its surface a crater of 30 to 40 feet diameter, and 15 to 20 feet in depth, would so tear up and excavate, furrow, and encumber the ground, as to render the movement of troops, still more of artillery, or the erection or repair of works within the area, impossible; but this is to anticipate a subsequent part of our subject.

The question of economic value or comparative cost of these large shells as against 13-inch, is one that may be viewed in several lights. In this, as in every object to be attained in war, if the instrument proposed is capable of effecting the object aimed at, speedily or at once, it will generally be cheap at whatever cost; and it is sufficiently obvious that if a fortress can be reduced, or a casemated fort silenced by the fire of a few 3-foot shells, or by only one, that would have taken hundreds or thousands of 8, 10, and 13-inch shells, to weary out its defence, the one or the few larger shells, are the cheaper and better instruments, even though they cost far more than all the smaller shells put together, men and time, both represented by money, are saved. But these 3-foot shells are competent to effect, what no profusion of 13-inch shells can possibly do, for, though we may fill the air, with a volcano of 36-inch shells, the whole can effect nothing beyond the powers of a single one of the same size; the casemate or magazine that resists one will probably continue to resist one hundred. This, then, is the practical view to take of the economic value of 36-inch mortars and shells, not what do

they cost, or what is the labour of their application, but what can they effect? Can they ensure a success where with 13-inch shells it is doubtful or impossible?

But the 36-inch shell need not shrink from a comparison with the 13-inch shell, even upon the bare ground of money cost. The actual cost of shell firing, of whatever sort, must be measured by the money expended to transfer to a given distance (viz. to the point of attack) a given weight of iron and powder, which are the elements of effect. Let us so compare the 13-inch and 36-inch shell.

The cost of each 13-inch shell in flight is stated on authority to be about 2*l.* 2*s.*, or 42*s.* for every 194 lbs. of iron and 10½ lbs. of powder. The cost of one 3-foot shell in flight may be taken as follows:—The shells made at the Royal Arsenal, Woolwich, recently, are stated officially, to have cost under 11*l.* each empty shell. The cost of the powder, 480 lbs. at 55*s.* per 100 lbs. and fuze, &c. may be taken at 14*l.* so that the cost of one 3-foot shell in flight is 25*l.* (It would become something less when practice should have made their casting at Woolwich more habitual and easy to the men; and I take this opportunity of acknowledging the beauty and perfection of form with which those large shells have been made at the Royal Laboratory under the superintendence of Captain Boxer, R.A. who has proved that as great, if not greater accuracy, of concentricity, sphericity, and gauge can be given to these shells than is even usual with 13-inch shells.) We thus require to fire forty-six 13-inch shells, to transfer to the point of attack, the same weight of bursting powder as by one 3-foot shell; and above thirteen shells of 13-inch diameter, to transfer to the same point, the weight of iron in one 3-foot shell.

Comparing the cost, therefore, we have for equal weights of powder—

Forty-six 13-inch shells at 2*l.* 2*s.*	£96	12	0
Or, One 36-inch shell at 25*l.*	25	0	0
Economy in favour of the 3-foot shell .	£71	12	0

Or again, for equal weights of iron—

Thirteen shells of 13-inches at 2*l.* 2*s.* . . .	£27	6	0
Or, One shell of 36-inch at 25*l.*	25	0	0
Economy in favour of the large shell .	£1	6	0

Or, thirdly, taking the powder and iron together, we have nearly—

Fifteen shells of 204 lbs. at 2*l.* 2*s.*	£31	10	0
One shell of 2,000 lbs. at 25*l.*	25	0	0
Economy in favour of the large shell .	£6	10	0

All this *assumes* that forty-six 13-inch shells, *could* effect the work of one 3-foot shell, which can never be, where the 3-foot shells are properly called into use.

I shall conclude this portion of our subject with a sentence of General Piobert's, enforcing his opinions of the value of vertical shell fire, which has rather lost ground of late years in favour of shell guns—

"Il résulte de là, que les feux verticaux, qui seraient susceptibles de jouer un rôle important, dans l'attaque et dans la défense des places, laissent beaucoup à désirer dont l'ancien matériel de l'artillerie état susceptible dans cette partie, n'abaient pas été réalisées, lorsqu'on s'est arrête dans la voie de modifications où l'on était entré." (Traité d'Artillerie, tom. i. p. 286.)

The value of vertical fire, remains yet to be fully understood and developed, as the only means of obtaining greatly extended ranges. Recent trials, proving the facility with which shells filled with melted cast-iron may be discharged, add immensely to the value of vertical fire, by providing an effective incendiary projectile, whose density is little short of that of a solid shot, and therefore capable of projection to an immensely increased range, at 45° over any ordinary shell, from guns, or rather long howitzers, of suitable strength and structure. Nor does it admit of doubt that, with a wrought-iron built-up gun of 12 or 15 calibres in length of chase, and strong enough to sustain heavy projecting charges, when elevated to 45°, these liquid-iron shells of Martin's, of large calibre, say 13 inches to 18 inches diameter, may be thrown to a horizontal range far exceeding anything that has ever yet been attained by any projectile.

Some of the advantages and distinguishing properties of the 36-inch shell, have already incidentally been noticed. I purpose devoting the remainder of this address to the consideration of some special applications of these shells in siege operations, with some proofs that by their means the duration and cost of sieges, as hitherto conducted, may be materially abridged.

Much as the improved ordnance, skill and "dash" of modern warfare, have abridged siege operations, since an army with its "trench masters" steadily "sat down" before a place, with the dogged determination either to take it after months of desultory labour and inaction, or reduce it by famine and epidemic, often affecting almost equally the besiegers and the besieged; still, even to the latest great siege, that of Sebastopol, the reader of siege narrative is ever struck, with the amazing waste of materiel, of distressful labour, of time, and of the health and life of men and animals, of which the duration of the siege is ever the true measure. When we examine upon what principal circumstances, common to all ordinary sieges, such vast consumption of time, men, and materiel depends, I think it will be found that they are chiefly reducible to three.

1°. The extreme inefficacy of the method of breaching by direct fire, viewed as a dynamic operation.

2°. The enormous and disproportionate mass of materiel needed for that operation due to its dynamic inefficacy.

3°. The necessity of creeping up slowly under cover to the "crest of the glacis," accompanied by the greater part of this ponderous and cumbrous materiel, before the decisive operation of breaching (to which all previous labour has been but preliminary) can be attempted with assured success.

All the difficulty and delay of this has been seriously increased by the general introduction of the modern rifle in place of the musket. The old besieger broke ground, probably, at from 1000 to 600 yards of the "enceinte," and at that distance, found himself not seriously incommoded by small arms; but the increased range and accuracy of the rifle have much enlarged the radius within which the besieger cannot venture without cover.

Were the nature of the cover demanded such, that for a considerable portion of the distance between the first parallel and the covered way of the place, a safe passage for troops or even field guns were *alone* needed, the work required would be comparatively small; but the real work of the heavy artillery scarcely commences until, inch by inch, the path is won up to the glacis, and under cover and along trenches sufficiently wide and deep, by far the largest proportion of the artillery and ammunition, and vast masses of other stores, have to be conveyed up to the covered way itself; hence the whole line of trench excavation has to be made upon a commensurate scale, and with enormous labour. And this labour is measured not only by the necessary transverse section of earthwork to be done, but by the length to which it extends, and the latter does not increase simply, with the increased radius at which the increase of modern range both of rifle and of artillery, renders it necessary to "break ground," but even more rapidly than with the square of this radius. For if we suppose the old "break ground" distance round a regular polygon to have been 1,000 yards, so that a circular zone of this breadth had to be covered with certain zig-zag works for a certain length of face, say one side of the polygon, then it is obvious that if we must now break ground at 2,000 yards, and have to cover with similar zig-zag works a circular zone of the latter breadth, and whose length is still measured by lines radiating from the extremities of one face of the polygon, that the surface to be covered with the besieger's works will have increased in length, *i.e.* in amount, in the ratio (at the least) of the square of the radii from the centre, or of the breadths of the zones. We are therefore led to anticipate in any future regular sieges of important fortresses, by the orthodox methods, a great increase of that lavish expenditure of labour and materiel, even over and above that which has characterised past sieges. After, however, all this labour has been surmounted, and its object has

been so far accomplished, by the besiegers having at length got up to the third or fourth parallel, or, as most usual and best, to the glacis of the place, that there he may establish his breeching batteries, and convey up his guns, mortars, and ammunition—what an inordinate mass of the latter has to be provided and fired away, in order that that most unmechanical and disadvantageously conducted operation of "battering in breech," may at last be crowned with success.

Let us glance at what the information of past sieges shows us as to this. It appears that to produce 100 feet lineal of practicable breach, by battering at 500 yards by direct fire, no less than an average of 214 *tons* of iron shot has been fired away. That to effect the same length of breach by ricochet fire (at Carnot's wall), more than 290 *tons* of shot was required; while at only 50 yards distance from the face of the scarp, the experiments at Metz proved that 5½ *tons* of shot was still needed to bring down 100 feet in length. And this latter fact leads to a fallacious conclusion as to the necessary expenditure of ammunition, unless we add to the 5½ tons, all that in actual siege must be previously fired away, in order to get a battery established, at only 50 yards from the face of the work. This would probably be as much again—say 10 *tons* of shot in all—masses of iron hurled against brick and stone with velocities the *vis viva* represented by which, would be competent, if better applied, to have actually lifted high into the air, the whole mass of rampart dislodged.

I find from Major Straith's large work on Fortification (p. 738), that "one must not think of attacking by siege any important place" with less than forty 24-pounders, eighty 18-pounders, and forty-six mortars, or between 650 and 700 *tons* weight of artillery. That for the siege of Bayonne, in 1814, the Duke of Wellington provided fifty-two 24-pounders, twenty-two 8-in. howitzers, nineteen 10-in. mortars, and many smaller pieces, and desired to have had much more, the weight of that brought up being much above 500 *tons* in artillery alone. And again (p. 744), Straith gives the particulars of the ammunition for a 20 days' siege, which amounts in weight to 2,559 *tons;* while we find (Artillery Institution Memoirs,) that the ammunition actually fired away by the British alone at Sebastopol amounted to 252,000 rounds, or in weight to probably

more than 10,000 tons, and the French threw into the place 510,000 round shot, 236,000 howitzer shells, 350,000 mortar shells, besides 8,000 rockets, and expended (during the whole campaign) 25,000,000 of cartridges. Taking the shot as averaging only 32 lbs. the howitzer shells 50 lbs. and the mortar shells 200 lbs. each, this return gives the amazing result of 43,800 *tons of iron only* as having been fired away by them; and, if we add one-fourth only for powder, &c. the gross weight of ammunition expended by the allied besiegers cannot have been less than 67,000 *tons*. (Report to Imp. Gov. of France, by Gen. Niel, Corps du Genie, 1858.)

The most prominent cause of this lavish waste of material, to effect a work in the end, so comparatively small as a breach of two or three hundred feet in length, is that mechanically considered, the operation of breaching by direct fire is one of the most disadvantageous possible applications of force. The operation, if attempted from the third or fourth parallel, or before the covered way is reached, makes little or no progress, and has very seldom succeeded, and for obvious reasons, for none more, than because it is impossible to see what the shot are doing or where they strike; but even when carried on from batteries within a few yards of the face of the rampart, at what immense disadvantage is the power of impact applied. What inordinate consumption of shot, aimed with the imperfections inevitable to dust, smoke, and every difficulty and danger, is expended in endeavouring to make the preliminary vertical and horizontal "cuts" into the substance of the masonry. How great the waste, to ensure that excessive velocity of shot that shall, bit by bit, splinter, powder away, and eat into, the inert mass of solid wall, that backed-up with still more inelastic and inert earth, absorbs the blows. How much is the shattering effect of each successive shot reduced and hindered, by the loosened stuff and fallen debris of preceding blows! At last, however, the wall is dislocated, salvos again and again are fired at its dissected masses, and they fall in rocky heaps forward into the ditch, and the steep and uneven talus, effectually screens the base of the rampart that may remain, from further demolition. But the fall of the masonry, has only exposed to view the earthwork of the rampart behind it. If sandy or loose, a few masses here and there slip down, and leave steep earthen slopes at angles of 40°, or often steeper, and the stuff that falls, running in

betwixt the rocky masses of the fallen wall, choke them up, from the further effects of shot, without making a sure or practicable path over them. Further cannonade now is practically useless. The shot penetrate deep into the earth-bank, and lodge there, but do its stability little harm. The earthen rampart, if penetrated at all, must be so by firing live shells into its mass, which, by a tedious but comparatively effectual process of diminutive mining, gradually blow it away. Can there be conceived a more unhappy application of means to an end? Contrast the materiel and labour expended with what would have done the work far more effectually had it been a case of "demolition;" had the besieger been in a position to have sunk some three or four shafts behind the wall from the top of the rampart, and fired, either simultaneously or in succession, three or four mines, each containing only a few hundred pounds of powder. But, it is replied, that is not possible—the besieger *cannot* mine the rampart (under any usual condition), and hence he is *obliged* to resort to this roundabout and awkward process of breach by cannonade. It is my object to show that *he is not obliged* to resort to it, and that *he can, by means of these 3-foot shells, mine the rampart at the back of the scarp*, and *so reduce the operation of breaching to one of demolition.*

But a few words more as to "battering in breach." The operation, as I have described it, is difficult, tedious, and imperfect enough, as applied to a scarp of masonry or brickwork; but let the rampart be wholly an earthwork, well formed and compacted, and of favourable material, and then direct fire from the outset becomes absolutely nugatory. Numberless instances have proved this: at Bhurtpore, in 1819, after fruitless battering, Lord Combermere was compelled to open a breach in one of the bastions of sun-dried layers of earth, by a formidable mine, laid and fired with great difficulty and loss of life; at the forts of Mocha, in 1824, when the walls, of similar material, were found impenetrable by shot, and were only slowly eaten away by firing live shells point blank into them; at Carnot's experimental counterguard wall at Woolwich, in 1822, into which the shot sunk "with as little injury as pins driven into a pincushion;" and, lastly, in the sad and costly experience before the earthworks of Sebastopol in 1854.

Again, let us advert for a moment to the attempt to breach by

direct fire the massive masonry of the Russian coast fortresses, consisting of several stories of casemates, with a flat parapeted top (bomb-proof to 13-inch shells), and exposing a face of granite.

It is but necessary to cast the eye, upon two vertical sections (figs. 4 and 5), to discern that such a construction is strongest (as

FIG. 5.

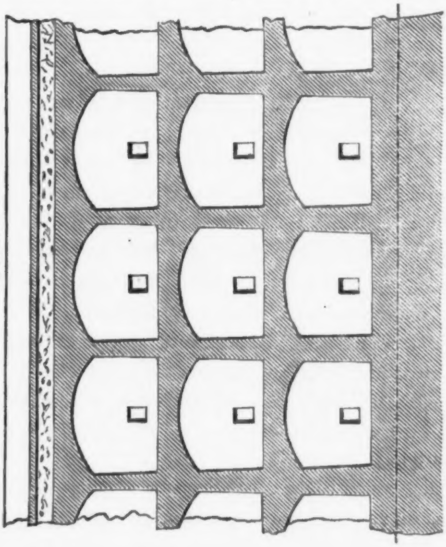
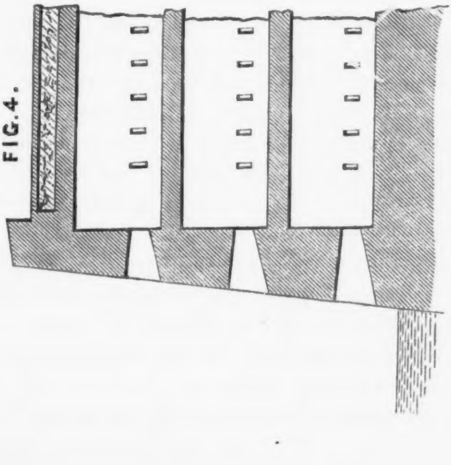


FIG. 4.



intended to be), and most capable of resisting impulsive force, in a direction perpendicular to the face of the work. Viewed as a whole, such a masonry structure is a huge *cancellated* mass, every portion of whose presentable face, is buttressed and supported, by the dividing walls and covering arches of the casements, that oppose their " end-on " strength, to every blow in the front, and smother by their great depth from front to rear, every vibration in propagation from the face of stone struck, to the rest of the mass. I will not attempt to trace minutely other formidable disadvantages, that batteries constructed on this model offer to direct fire. At Bomarsund, where alone such a structure succumbed to direct fire, blows were in vain, and the face impervious, until the granite blocks of the exposed face, or the ends of one or more casemates, had been bit by bit splintered and pounded to dust, and at length driven in—a sort of breach that, leading between the loop-holed walls of a long casemate, can scarcely be deemed "practicable," if stoutly defended, even though half a dozen such " casemate ends " had been demolished at once and together.

But if these Russian masonry structures, are strongest to resist a blow delivered perpendicular to the face of the work, in what direction are they weakest ? I answer, decisively, vertically. The crowns of the arches of the successive stories, between the walls of the casemates, are their weak point, and to heavy vertical fire, of shells of sufficient weight and explosive power, they can be made to succumb, and almost without power of resistance.

Having thus pointed out some of the delays and difficulties of the ordinary methods of breaching, I arrive at one of the main objects of this address, to point out, namely, how effectually shells of large size, such as those 3-feet diam. can be applied, in replacing to a great extent direct fire, as instruments for breaching either revetted or earthen ramparts, or coast batteries of masonry, and to follow out very briefly some of the consequences that must result from their use thus, in abridging the duration and cost of sieges.

It will not be disputed that a 36-inch shell, holding 480 lbs. of powder, and buried 15 feet or more in earth, &c. is in fact a mine, and one of no mean size and power, if it will dig out a crater of 12 or 16 feet deep, and 40 feet diameter, upon explosion. Nor will it now be matter of debate that such a shell is a mine capable

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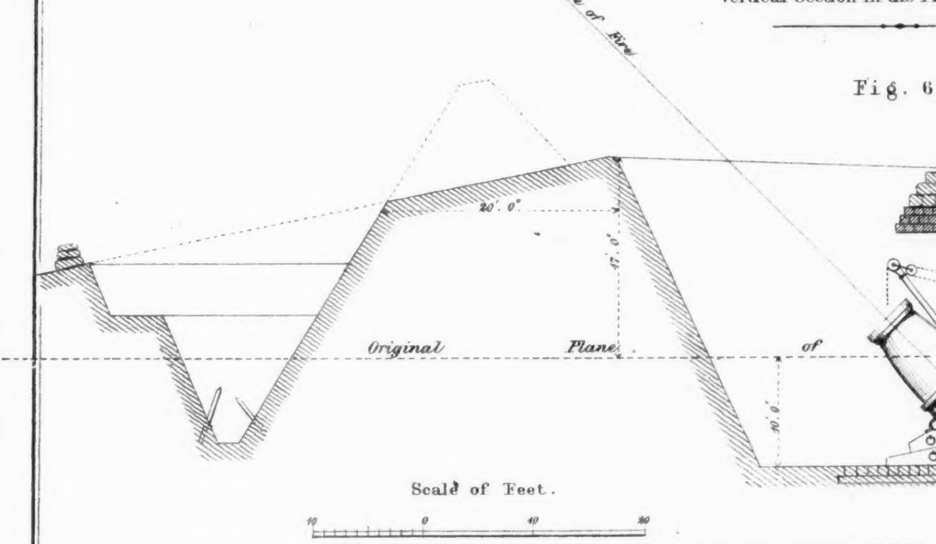
THIRTY SIX INCH MO

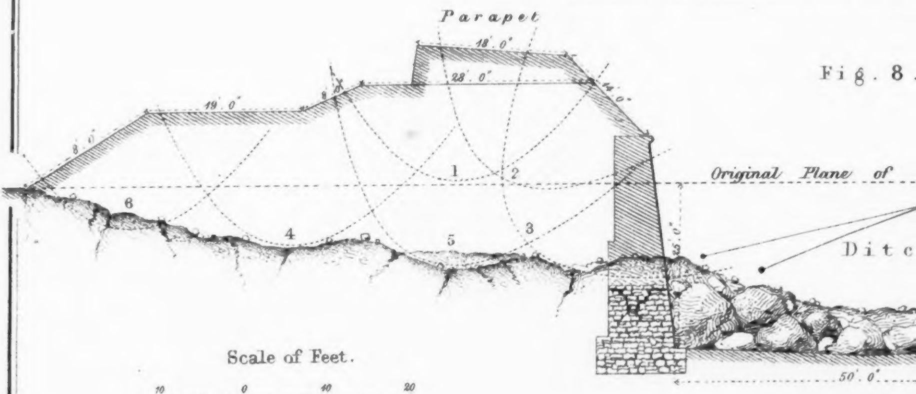
Vertical Section in the Pl

Fig. 6



METHOD OF BREACHING BY 36 IN

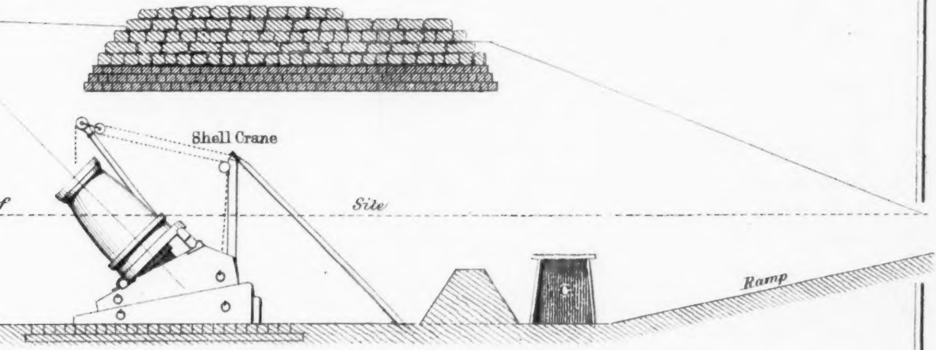
Fig. 8.



IX INCH MORTAR BATTERY.

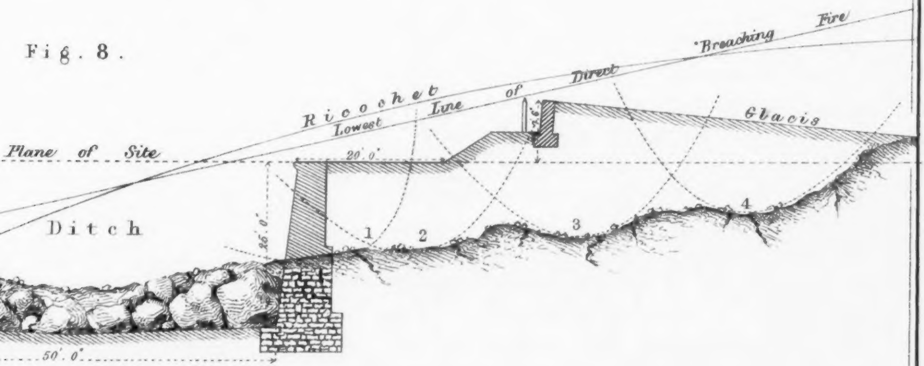
ection in the Plane of Projection.

Fig. 6



NG BY 36 INCH SHELL EXCAVATION.

Fig. 8.



J.R.Jobbins

of being instantaneously lodged, (within certain very moderate limits of deviation) upon any required spot, at a distance of a mile or two, or greater if necessary, and also capable of burying itself, by its own penetrative power, to the required depth, within the limit of some 15 or 18 feet. Upon these premises then my proposition is founded, which is *to substitute for direct fire a vertical fire of 3-foot shells upon the rampart requiring to be breached, and also upon the covered way and glacis opposite, to blow the material of the whole away, crater after crater, until the rampart has been levelled or reduced in height, and the counterscarp and material beneath the covered way and glacis have been similarly excavated into a rough incline, leading to the bottom of the ditch, or rather to the déblai, that will almost have filled it up.* In one word, I propose to show, that by means of such shells, thrown from a moderate range, and with the precision of which they are now proved capable, *the ancient operation of battering in breach may be reduced to one of demolition.* One in which the besieger shall be enabled to place these "flying mines" within the mass of the rampart, without the power of the besieged to prevent him, and may, by thus changing the awkward work of hammering the wall to pieces, for the rapid and effectual one of crater excavation, complete a breach of vastly greater dimensions than has been heretofore deemed sufficient, in less time and with less expenditure of life and money. Furthermore, that the enormous powers developable from this method of breaching, enable the besieger to make a breach of such vast magnitude, and with such powers of keeping it open, that any attempt at repair, or obstruction, (other than against the column of final assault) must, even with the most numerous and well provided garrison, be impracticable. Time will only permit me to follow out incidentally by the aid of the diagrams (fig. 6 and 7), the details of this method and their consequences, leaving to the scientific officer, to supply what I must omit, as well as to decide upon the truth or fallacy of what I advance.

Let us suppose then, that the besiegers have arrived (entrenched) within 1,500 to 1,000 yards of the counterscarp of the place, and have there established a battery of 36-inch mortars. Taking advantage of any low hills, or other natural cover from the enemy's notice, and diverting his attention, as far as possible, from the object

of the work, the mortar battery is to be sunk below the general surface, and constructed generally upon the plan shown in fig. 6. A heavy rampart in front secures each mortar from direct fire, and may be strengthened against sortie by an external fosse, with palisades and a small covered way above its counterscarp, with sand bags on the top of the glacis, to cover riflemen, the covered way communicating with the interior or rear of the battery by defensible passage at the flanks.

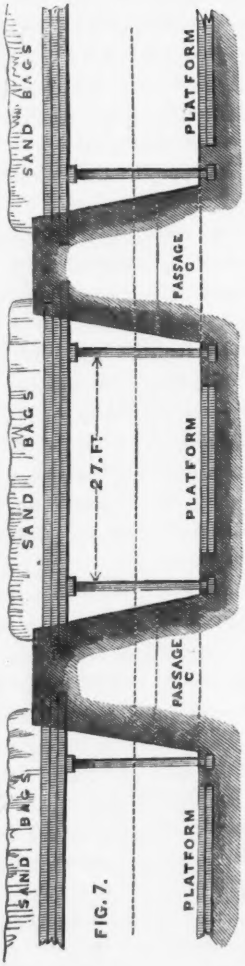


FIG. 7.

A heavy flank traverse, or epaulment, runs between every two mortars, from the rampart in front to the rear, and at once protects the mortars from enfilade, and serves to sustain the triple tier of whole balk or round timber, which, covered above with six feet of sand bags, forms a splinter-proof above each mortar and its shell-loading crane, and is proof against all ordinary vertical fire. The platform for each mortar is of whole balk timber, laid close, but not bolted together, and planked over with 3-inch oak plank, 24 feet square is sufficient, and hence the width between the traverses at the level of the covering splinter-proof, will (in ordinary earth) be about 45 feet. To avoid the necessity for any long timber, therefore, uprights may be placed beneath them, close to the foot of the traverses at either side, as seen in fig. 7, from the rear in a plane transverse to the section, fig. 6. The bearing may thus be shortened

sufficiently, and still leave the central span pretty long, so that the bed of timber shall be *resilient under the stroke* of a heavy shell.

The sunken battery is approached by a ramp from the gorge at the rear,* and it will be advantageous, to carry a traverse of about 5 feet high, across the rear of each separate cell of the battery, leaving a free passage of 6 or 8 feet at one end, so that common shells falling in rear of the splinter-proof and bursting there, may not injure the mortar or men.

On examining fig. 6, every engineer or artillery officer will, I expect admit, that a battery thus constructed protects pretty effectually the large mortars within it from direct fire, (never very accurate and formidable at 1,000 or 1,500 yards), and from vertical fire to a great extent. When liable also to a serious ricochet fire in front, lobbing in over the rampart, a cresting parapet may be raised upon the latter of earth or sand bags, as shown in dotted outline, by which such fire may be absorbed. A passage or short "souterrain," C. pierces each traverse, and gives the means of rapid communication (and support in case of sortie) between all the cells; such passages made 6 feet high by 4 feet wide also afford places of momentary retreat and safety, to the gunners in the mortar battery, when a live shell shall happen to drop within.

If we suppose a battery of only five 36-inch mortars, each in a separate cell, we shall have six traverses, including the exterior epaulments, and the entire front of the battery will occupy about 330 feet in length. The position for sunken batteries, must depend much upon circumstances and choice of ground; but, I conceive, should be by preference established upon a capital, and not opposite a flank or curtain. As a highly important organ of operation, it should be amply protected, by flanking batteries giving a converging or cross fire towards the place, and with powerful reserves close at hand.

* Where the land is naturally wet or flooded by rain, and natural drainage for a sunken battery, without great labour in excavation, cannot be obtained, a small portable high-pressure steam engine, with attached pumps—or better with a chain of buckets or centrifugal pumps, to preclude injury from dirty water—may readily be employed to keep a sunken battery dry. Ten horse nominal power would probably be sufficient in any case for a 5-mortar battery; and, mounted on a travelling carriage, its transport would be as easy as that of an 18-pounder. The small amount of fuel can never be an obstacle.

With a mortar battery constructed as has been shown, nothing can be seen of these large mortars by the enemy, and until they open fire he should be kept as far as possible ignorant of their preparation. When they commence to throw shells, he will of course strain every effort to silence or destroy them; but this will not be found easy to accomplish in any way. For, first, they will have done their work and effected a large practicable breach, before it will be possible for any very preponderating fire to be brought upon them. Each mortar is a large object, but though large it cannot be seriously damaged even if struck within the battery—no shell under a 10-inch diameter falling on to a 36-inch mortar, and bursting within or beside it, can do it much damage; and no shot but of the heaviest calibre, and striking point blank and at a high velocity, can materially injure it. Nor even if so struck, and were one segment or portion of the mortar wholly destroyed, is the mortar more than temporarily disabled—a new segment (all fitting indifferently), can be put in to replace the injured one, and fire then recommenced. In twenty-four hours a 36-inch mortar can be completely mounted from the level of the platform, the latter having been laid, and the crane previously erected.

Nor can these large mortars be destroyed by spiking, or in any other of the ordinary methods by which smaller artillery is rendered useless. As a man with ease can conveniently work in the inside of the mortar, so a spike can be driven back out of the vent from the inside of the chase, and the size of the piece precludes any attempt to overturn it or to wedge projectiles into it; in fact the enemy, if in temporary possession of the mortar battery, could do nothing more than destroy the cranes (for which duplicates must be in store at the rear), or, if provided with an enormous supply of powder bags, might succeed in tumbling some of the mortars over, which would demand probably 48 hours to set to rights again.

The mode of pointing these large mortars from those sunken batteries, without seeing the object to be struck, nor being seen from the place, is very simple; in front of each mortar a slender pole of some 10 or 12 feet in height is placed vertically upon the top of the front rampart, and fixed (at some time when the enemy's attention is diverted) so that the direction of the required plane of pro-

jection shall pass through *it*, and through the base or breech sight of the mortar. A theodolite with transit motion is placed on the gorge of the battery at the rear, in such a position that the officer in charge can see this pole or staff, and both sights (the muzzle sight and the base or breech sight) of the mortar. The observer, causes the mortar to be shifted in azimuth, until the vertical wire of the telescope when the latter is moved up and down in a vertical arc, will intersect the ranging staff, (which he sees over the splinter-proof), and both sights of the mortar, which he sees beneath it.

If the distance or horizontal range be known previously, and the projecting charge be suited to that, and to the elevation of the mortar, the shell on being fired will reach the intended point. This method of telescopic ranging (which, so far as I know, was first proposed in 1854 by myself,) possesses great advantage in point of accuracy, over the old and crude methods of ranging mortars, such as by a plumb line held in the hand. There are other methods, requiring a specially prepared theodolite, by which all the mortars in one battery, can be ranged by the one instrument, and from a single station.

The mortar battery having been got ready to open fire, and the position and size of the breach determined on, the shell firing is to commence, and with careful and steady practice, their fall is to be continuous, over such a length and breadth of the rampart and of the glacis and covered way, as it is determined to excavate and blow away, to form the breach. If there be mortars enough in play, to engage with both the interior and exterior sides of the ditch together so best; if not, by preference, the excavation of the glacis and covered way, and the blowing down of the counterscarp, should be first proceeded with, as opening a better view of the rampart to the base of the scarp, and enabling the shells that are to overthrow it, to be better directed.

Fig. 8 shows in section the rampart, ditch, and front of the glacis of a fortress, the dimensions of which are figured; the irregular curved line marked by shading passing from the outer slope of the glacis to below the mid-height of the counterscarp across the ditch, partly filled with déblai and rubbish, and continued at about one-third the height of the scarp, and up through the whole rampart to the terre plein at the rear of it, marks the surface of the breach

when formed, by the process of demolition or excavation by 3-foot shells. The outlines of the successive craters of excavation, from each shell in the plane of the section, are indicated by the parabolic curves in dotted lines. The order in which they are formed being marked by numerals.

The shells 2 and 3 at the scarp, and 1 at the counter-scarp, find *their* lines of least resistance, necessarily inclined inwards towards the ditch, like any ordinary mine of demolition, sunk to the same depth (12 or 15 foot) behind and near the revetments; they therefore blow them both inwards, and overthrow them into the ditch. Much of the déblai, earth, and rubbish also, dislodged and blown out of the other craters further back, is thrown into the ditch, and so a sufficient filling is produced, (if it be a dry ditch) to cross without ladders or fascines, if a wet ditch the latter may still be to some degree needful. The revetment walls, if of good brickwork or masonry, will, under the explosive heave of the 3-foot shells, fall in huge masses into the ditch, and may possibly be so large, as to obstruct the passage of the assaulting column over them; in that case, a fire of small shells and of heavy shot, must be maintained during the breaching operation, and thrown, en ricochet, as shown by the curved shot track, amongst these masses, to pound and pulverise them further. It is quite probable, however, that the earth and small rubbish that will necessarily fall from the craters, amongst the large masses of the fallen revetments will sufficiently fill up and level between them without that operation.*

* I had occasion some years ago, when making experiments on the transit rate of impulse in wet sand, (with reference to Earthquake Dynamics), by means of mines exploded beneath that medium, to ascertain some facts as to the proportional amount of déblai that was thrown permanently out of craters, to that which returned to the crater by falling again into it. With 2-line craters, I found that about one-fourth of the expelled volume of sand, fell around the crater in a zone whose breadth was equal to its radius, and formed a bank around, whose section was a beautiful curve of double curvature, as seen in fig. 9; and that in a calm atmosphere, about one-eighth of the expelled volume, fell back into the crater, leaving its form as so partially filled up, a paraboloid of less eccentricity shown by the double curve, fig. 9.

But when the quantity of powder in relation to a constant depth of axis was increased, so as to produce a 5-line crater or upwards, the volume of déblai that fell around within the radius of the crater, did not amount to one-thirtieth of the total volume expelled, and that which returned by precipitation into the crater,

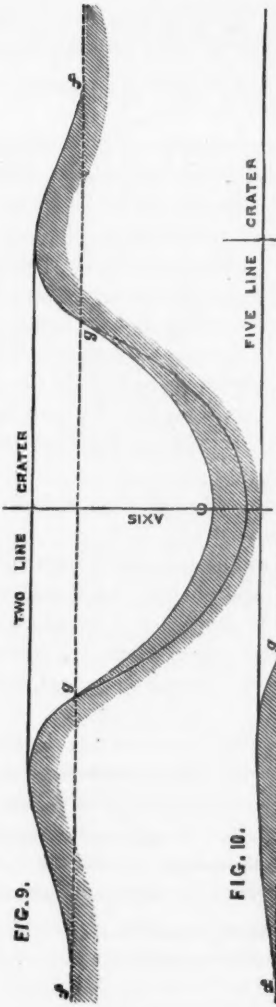


FIG. 9.

FIG. 10.

was too small to be accurately estimated, as shown in fig. 10. As our 3-foot shells will always give 3 or 4-line craters, and in most cases 5 or 6-line craters, there can be no apprehension of any considerable loss of excavating power, by the falling back of déblai into them.

The right-lined shot track in the figure shows the lowest point at which the scarp can be reached by direct breaching cannonade, from a battery established, even on the crest of the glacis, and with a ditch of 50 feet in width.

The operation is, I trust, now intelligible without further description. The objection will, no doubt, first be made, that, although it is undeniable that a breach of this sort may be thus created, still, from the inevitable inaccuracy of shell-firing, &c., the expenditure in shells, and in time and labour, would be enormous to attain the end.

Let us calculate in figures how far such an objection is valid.

We will assume the very modest armament to the besieger, of but 5 mortars of 3 feet, that only 4 shells per hour are fired from each, and that the fire is only carried on by daylight (for breaching purposes), or say 12 hours out of the 24. We have, therefore, 48 shells per mortar per day, or 240 per day from the whole battery.

We will further assume a size of breach ample in its width, say 200 feet lineal along the line of the scarp.

On examining the fig. 8, it will be seen that one crater in depth, is sufficient to clear out all required, from the covered way and glacis, but that two craters in depth, (*i.e.* a second shell penetrating below the bottom of the craters blown out by preceding ones), are required for the rampart beneath the parapet, and just in rear of the scarp.

The breadth of slope to be cleared by craters; at the side of the glacis is about 75 feet, or a space of 200 feet wide along the line of ditch, by 75 feet transverse to it, and the breadth beneath the rampart, is 80 feet, by the same 200 in length; but, because of the double tier of craters beneath the parapet, we will call it 100 feet. The whole surface to be blown away by craters is, therefore,

$$100 \times 200 = 20{,}000 \text{ square feet,}$$
$$75 \times 200 = 15{,}000 \text{ square feet,}$$
$$\text{or, together,} \quad 35{,}000 \text{ square feet,}$$

equal 3,888 square yards, say 4,000 square yards. Now each crater, at only 10 feet penetration, will give an average horizontal surface area of circle, of 30 feet in diameter, equal 78 square yards.

$\frac{4,000}{78} = 52$ shells, to form as many craters as will excavate the entire surface and mass of the breach.

We have already seen with what certainty, these large shells can be thrown, within a space equal to the area of a circle of only 21 feet diameter, at a range nearly double what we are now dealing with, and we should be justified in assuming that at 1,000 to 1,500 yards, at least two-thirds of all the shells thrown, would fall at points to be completely effective; but I shall not ask this; I will suppose, that only one shell in four, of those thus thrown falls with sufficient accuracy to be effective at the point required as an engine of excavation.

Then it follows that we must throw $4 \times 52 = 208$ shells to obtain the work we require done by the 52, and this will be only one day's work for the five mortars (throwing 240 in 12 hours), with nearly one-fifth of their power to spare.

Were we to go further even, and assume that the accuracy of fire of these shells, was no better than that of 13-inch shells, and that only 10 per cent. of all the 3-foot shells fired, were effective for breaching excavation, the method would still prove the most rapid and efficacious method yet proposed.

This method of breaching, limits the use of "open trenches," very much to the means of bringing troops only, under cover, up to the breach or place. The trenches within a radius of 1,000 or 800 yards of the place, are no longer required, to admit the bringing up of heavy artillery, and siege stores and ammunition; hence for all the latter stages of the siege, flying or full saps, may probably be in great part substituted for open trenches, to gain cover in the approach, for the final rush and assault.

But from the rapidity, with which the breach will become opened and practicable by this method, it will be necessary that every possible preparation be made, before opening the heavy shell-fire, for the closest possible approach to the breach; hence such saps or trenches of approach, should be pushed as far as possible in advance of the mortar battery, before the latter unmasks its fire, and such advanced approaches, should be fully sustained and supported, by a sufficient fire of artillery in advance, to silence the guns of the place that can be brought to bear upon them. In fact, the use of cannon

in this method, becomes limited, to assisting the bombardment in silencing the fire of the attacked front, and in sweeping the breach clear, up to the moment of assault.

It is needless to point out, that all the small but fatal difficulties of assault, when the breach is made by the usual mode, that so often have led to failure, such as ladders too short to get down into the ditch, or too weak to mount by, and so forth, are abolished by a method, whose main characteristic is, that it opens a clear, though rough, road of 200 feet wide right into the place, leading, down one rude slope across the ditch, and up another such slope, into the interior of the defences.

The very method itself, by which the breach is excavated, renders its defence by means of mines, on the part of the besieged, (under the glacis, &c.,) impossible, inasmuch as for the whole breadth of front, the ground is blown up and overturned, and if defensive mines have been prepared, they probably explode with the 3-foot shells, and add their assistance to the work of excavation.

It will probably be admitted, that a power capable of excavating a breach of 200 feet frontage, in one day, and of actually digging away that length of rampart, day by day, from any part of the works within range, must defy any attempt on the part of the besieged, to repair the breach, or seriously obstruct it. The power of crater excavation, in fact, far outmatches, all the power of restoration of earthwork, by manual labour, that the most numerous garrison could produce.

Such, is the enormous power of excavation, conferred by these shells, that the whole extent of interior surface, of a large bastion of several acres, might within a few hours, be so upturned, dug into pits and craters, its entire plane furrowed up, its buildings and casements levelled, and its guns buried in rubbish, that not only, the remounting of its defence, should be impossible, but the very movement of troops in formation, over its volcanic surface, be impracticable, even if not exposed to fire of any sort.* And such,

* There are 4,840 square yards in an acre—therefore, with 10-foot penetration and 30 feet diameter of crater, sixty 3-foot shells, would tear up and overturn its entire surface, leaving it a complete network, of deep pits and steep ridges between ; and even half that number of shells, or 30 craters per acre, would make the surface perfectly impracticable, for the movement of either troops or materiel.

when the mortar power is adequate, would no doubt be the most effectual mode of silencing the fire from the place, preliminary to the actual excavation of the breach; to be practised against the bastion in whose " enceinte " the position of the breach is resolved upon. At night, the 3-foot mortars should be kept in play at random, upon the other parts of the fortress, or upon the city itself. At longer ranges, the interior of the place may, in two or three nights, by five or six such mortars, be made absolutely uninhabitable. Casemates, magazines, vaults, and cellars of houses, arched churches, or public buildings, bomb-proof (so called) barracks, splinter-proofs, and every other shelter—all yield beneath the crushing fall of these desolating instruments; everything becomes with appalling rapidity, a heap of ruin, and it needs but little imagination to perceive, what must be the reaction, of such civil demoralization, upon any garrison.

Success, at whatever cost, is the first thing in war; and, however terrible and inhuman the contemplation of such destruction appears, in this, as in everything, extremes meet, and the possession and use of any power of destruction, that in the given circumstances, is like the " bolt of Jupiter," absolutely irresistible, becomes in fact and in the end, the means of saving life, and abridging human suffering, as well as of saving time and money.

To trace the effects of this method of siege into all its details, to show its power of abridging all the ancillary works of attack, is impossible here. I therefore leave such to the consideration of the officers of our scientific corps, and shall add but a few words as to the comparative weight of materiel, ammunition, &c. to be brought up for this and for the old method of breaching. I have already pointed out that a practicable breach can be produced by this method of excavation, from a distance of 1,000 to 1,500 yards of the place, long before the crest of the glacis can be won, by slow and damaging approach, and a sufficient artillery and stores, got up to this advanced point, under continual and powerful obstruction from the garrison, even to begin, battering in breach; and I cannot, as a fair comparison would warrant, estimate the difference in delay, difficulties, and loss, between establishing a mortar battery of the most ponderous sort, with all its stores, at an average of 1,200 yards from the place, and completing breaching batteries at perhaps 100

yards from the scarp, or even nearer. I will be content merely to compare the weight of material, that must be brought up, and assume it, to the disadvantage of my system, brought to the same point of nearness to the place, and with equal obstruction from the garrison.

We have had professional authority that, at 500 yards, 214 tons of shot alone is required to produce 100 feet lineal of practicable breach, or 428 tons, for 200 feet lineal, the length taken for our shell breach. I shall not pass the reality, if I assume that the siege guns, and equipage, the powder, and other necessary stores, (exclusive of platforms or any stores for formation of the batteries,) weigh as much as the shot expended. This would give a total of 860 tons, to be brought within 500 yards of the place, for breaching purposes exclusively, in breaching by direct fire. To effect the same by 3-foot shell excavation, we require—

5, of 36-inch mortars	260 tons.
Say 250, of 36-inch live shells, at $1\frac{1}{4}$ ton . .	312 ,,
Projecting powder and stores, cranes, &c., say .	50 ,,
Or a total of only	622 tons.

And requiring to be brought, only to within 1,000 yards of the place at the nearest. Thus actually saving in the transport of materiel for breaching only, 238 tons.

The materiel itself, for 36-inch mortars and batteries, is little if at all, more difficult of transport, than that for 32-pounder breaching batteries. Nor, when the small number of 36-inch mortars, competent to do the work, is compared with the large quantity of cannon, required to bring into play and repair casualties, will the amount of stores and labour to be expended upon the batteries for the former, (large and ponderous as they must be,) exceed in total amount that needed for an equal result upon the present system of gun batteries. It will often happen, that bombardment by 3-foot shells, can be conducted from the sea, or from river mouths, &c., from flat mortar rafts, each carrying one 3-foot mortar upon a steady deck of 60 feet, by 120 feet in length. Such were the mortar rafts designed by me for Government, in 1854-55, to carry those mortars into the Baltic and Black Seas. Each mortar raft drew but 3 feet of water with mortar and

50 shells on board, and was formed of an aggregation of nearly cubic cells, of about 8 feet square in plan, divided by water-tight bulkheads, all of plate iron; so that any one cell, if pierced through deck and bottom by the fall of a shell, merely filled itself alone with water. The deck of timber was so formed, as to be proof against any shell under 10-inch. The bulwarks all round, were of elm and teak, and at a mile distant practically shot proof; and the plates of the sides, were covered with similar timber 3 feet below the water line. Two screws, and a small pair of high-pressure engines gave the power of slowly moving the raft, and of slewing it in azimuth, so as to range the mortar without moving *it* upon the raft.

The whole raft only exposed to the enemy's fire a vertical surface of about 65 feet, by 8 feet in height, and at a mile range would have afforded a very small mark.* Other details of arrangement, by which such rafts were divisible into segments, for transport from England, provisions for being towed into and out of action, as well as constructive details, I must pass over here. The construction of these rafts was rendered unnecessary, by the sudden conclusion of peace with Russia.

Whenever locality admits of such a mode of attack from rafts afloat, the 36-inch mortar is as easily brought to bear as a 13-inch, and there is then absolutely no question of transport.

I have far exceeded the limits I proposed on this occasion, and shall therefore only just advert, suggestively, to two or three other military uses of these large shells, to which I believe they may be occasionally put with advantage; and,

1st. For the rapid reduction of large capitals, defended by a ring of isolated outworks, "*forts detaché*," — a method of fortification, the value of which, appears to be increasingly appreciated and brought into use, as at Paris, Ulm, Rastadt, Posen, &c.—these shells appear to me to afford a potent instrument. The garrison of such forts is on principle proportionally very large, the area embraced within the *enceinte*, relatively and absolutely small; hence the paralysing effects, of pitting and ploughing-up the ground within,

* I proposed painting the hulls a grey sea-green to confer still less visibility—which I observe has since been adopted by the Admiralty with several of the gun-boats.

and making the surface unavailable, for communications and movement, by means of these shells, becomes proportionally distressing to the garrison.

2nd. Such forts, as well as many other larger and otherwise circumstanced fortresses—such as Ehrenbreitstein, &c., the mediæval towns of eastern Europe and of Asia, and the hill-forts of India—stand upon isolated crests of rock or knolls of hills, and are so elevated, that reduction by direct fire is nearly impossible, and the vertical fire of ordinary shells, though always effectual in the end, (see instances in Straith's Artillery and in Sir Charles Napier's Memoirs,) is tedious, and, from the command possessed by the place over the besiegers, attended with serious loss in proportion to the time consumed. In such cases these large shells would seem to offer great advantages, when the country will admit of their being called into use.

3rd. In the contrary extreme, viz, as against low-lying forts or redoubts, almost sunk below the surface, of flat and swampy country, and offering almost no mark to direct fire, they present the means of prompt reduction. An instance of this occurred in the wars of Napoleon I. in our expedition to Flanders: when a small low-lying British fort on the Scheldt, near Antwerp, armed with but one howitzer, and (as I am informed) one gun, withstood the cannonade of a French 80-gun ship for a whole day, and ultimately beat her off, scarcely anything appearing above the swampy surface, but the muzzle of the howitzer. A mortar-raft, with one 36-inch mortar, would have dug the whole of the little fort out of the earth, in an hour.

4th. For the destruction or demolition from a distance, of particular structures, that cannot be approached at all, as, for example, docks, tide-basins, lock-chambers, large bridges, towers, and moles, or breakwaters, &c., shells of this magnitude, dropped into and fired under water of considerable depth, are capable of dislocating and shaking down huge masses of masonry, even of the best put-together ashlar work. The perfectly solid and homogeneous mass of water, acts as a thoroughly resistant anvil or fulcrum, to the blow of the explosion, whose shock is propagated through it to surprising distances, and transmitted to wharves, walls, batteries, dock-gates, &c. around. A

mole, such as that at Cherbourg, might, by a few days' 3-foot shell firing, be quite cut through, and land communication between its forts intercepted, or even a water-passage for gun-boats produced.

5th. Hitherto I have spoken of these shells only as offensive instruments; they have, however, their defensive uses also.

Wherever, for example, narrow entrances, or marine tracks, through straits, or round points of coast, exist, that ships, in attempting the attack of some place, must pass to reach it, as for example certain points off Portsmouth, there the establishment of a 36-inch mortar at the spot, with the conditions of moderate range, previous and constant practice, care in the selection of weighed shells, and accurate charges, will ensure to a reasonable certainty our being able to throw these large shells upon the deck, or close to the track, of a large ship; in the former case, the successful throw of a single shell must be decisive; in the latter, one of these shells, exploding in water 5 or 6 fathoms deep, within 50 or 100 feet of the hull of a passing ship, would probably sink her, or so damage her by the shock, as to render her for a time powerless, and a mark for the fire of all the batteries around.

One objection has been made to these large shells, or rather to the mortars, which is much more specious than valid, viz. that, partly from their construction in separate pieces, partly from the great strain of such heavy projectiles on the piece, their duration in serviceable condition will be very short.

Without going lengthily, into the peculiar principles of "laminated structure" (for the first time put in practice on a large scale in these mortars), I cannot prove, as I should wish, that, when experience shall have decided the best proportions for every part, they will be *more* durable than any known artillery. I content myself with stating here, that if each of these mortars were to cost £5,000, or twice the price which they can be now made for, and only to last to fire one hundred rounds, and yet be capable of performing what I advance for them, they are the cheapest ordnance, for their proper purposes, in the world. I see no reason, however, why each 36-inch mortar, should not last 1,000 rounds, or more.

Many other applications, of value for special ends, will no doubt occur to the experienced soldier, and possibly also some doubts and

difficulties with respect to parts of what I have advanced. As to these I would only say, in conclusion, the powers of these shells, and the capability of throwing them, are *now matter of fact—both were once denied.* If these cardinal facts, have become established, contrary to preconceived doubts, and imagined difficulties, shall not any smaller obstacles to the use and general acceptance of so potent a weapon vanish ere long ?

It remains to be seen whether our Government will follow out the leading facts that have been already ascertained, or slumber upon them, until (as in the case of the Minié Rifle) other nations shall have perfected and applied our invention, and we are compelled, after some humbling lesson, to adopt our own weapon from their hands.

In the discussion which followed the reading of Mr. Mallet's paper, it was objected by Lieut. Jeffries, late Madras Artillery, that, the breach being made in the salient of the bastion, his system did not appear to provide for the destruction of its flanking defences, for which at least artillery would be required. That at the range proposed for the 36-inch mortar battery (under 1,500 yards), the besieged might render the service of these large mortars extremely difficult by a well-sustained vertical fire of small shells from the advanced works of the place or from mortar-pits, and that if the garrison were enabled to obtain a preponderating vertical fire upon these mortars their service would be impossible; while the falling of a large shell upon the muzzle itself of the mortar would involve the replacement of that part (or segment) at least.

It was observed that at shorter ranges, such as 900 yards, which the author deemed, when obtainable, best in point of accuracy for breaching purposes, the penetration of the shell was not 15 ft. but only 9 ft., and it was thought the recoil would become excessive, as was found to be the case with common 13-inch mortars, if the 36-inch were elevated so as to give large penetration at short range, besides introducing great inaccuracy of practice. It was also inquired, whether the fuzes of these great shells might not be subject to be smothered out by their great penetration in the earth? and,

with a view to show that the transport and management of these mortars would be attended with difficulties, it was asked how long it had taken at Woolwich, and how many men, to build one mortar together for trial, and what time and number of men would be required, after sufficient practice, to do the like work in actual service? Also whether the transport of the parts of the mortar had been tried over Shooter's Hill, as well as over Woolwich marshes?

With reference to the peculiar construction of the mortars themselves, in hoops or concentric laminæ with initial tension, it was asked whether that method of construction had not been before applied to artillery, and whether it were not involved in the construction of the wire gun of Mr. Longridge?

In reply to these remarks, the author of the paper stated that he conceived he had shown therein, that the powers of these shells were such that the whole interior of the bastion selected for being breached could be rapidly torn up, and its defences in flank, as well as everything else within it, destroyed and overturned, in a time so short, from the moment of opening vertical fire, that but little, if any, support from direct enfilade fire of artillery would be needed to silence the fire from the adjacent flanks, and that this shortness of time given to the besieged, forbad the possibility of their concentrating any serious amount of fire, vertical or otherwise, upon the 36-inch mortar battery. The peculiar construction of mortar battery, proposed by him, also reduced the mark for effective vertical fire to the few square yards of uncovered space at the muzzle of each mortar, and, with the known inaccuracy of fire of ordinary small shells, but very few indeed of those fired could be expected to fall within the battery, while the chances of one falling upon the muzzle of the mortar was remote in the last extreme. He did not deny that, in the event of the garrison being assumed capable of concentrating a preponderating vertical fire upon these mortar batteries, their service might become difficult or impracticable; but that was an objection common to every method of attack, and the chance of its realization greater as the duration of the besiegers' fire was necessarily longer; that hence it applied with the least force to his method, which completed the breach within twenty-four hours of opening fire. The author did not limit the range for vertical breaching fire to 900 yards; he

thought, after due practice, 1,500 yards would probably be better. At either range sufficient penetration could readily be had for the rapid degradation of the rampart and glacis, without resorting to very high elevations of the mortar, or any loss of accuracy in practice.

The recoil had on actual trial been found moderate and manageable; quite as much, if not more so, than with 13-inch sea or land service mortars. Mr. Mallet proposed that bronze fuzes should be used for these large shells, timed abundantly long, and containing a thick column of composition, to give a large body of fire that could not be "smothered out" on penetration. "Smothering out" conveyed a wrong idea as to any composition that derived its supply of oxygen from its own material; if that contained enough of nitre, or other oxygen-giving salt, smothering was impossible; and he instanced Bickford's patent "Sump fuze," prepared for wet blasting in mineral mining operations, which burnt well and with certainty under water, even of five fathoms or more in depth.

As respects the time, labour, and difficulty of putting together and transporting the mortars, the author stated that at Woolwich two skilled workmen and six or eight gunners had put one together in about two days—that, after due practice in service, eight skilled men and a few gunners could put a 36-inch mortar together ready for use in less than 24 hours. No trials had yet been made to transport any part of these mortars over hills such as Shooter's Hill; but, taking the heaviest part at eleven tons, there was no civil engineer or contractor who would hesitate to undertake its transport over any country in the world where fortresses exist demanding the application of such a weapon for their reduction. These mortars were not for field service nor yet for mountain warfare—in their proper place in warfare no difficulty could occur in transporting masses far heavier than eleven tons.

The author stated that loads far heavier were constantly transported for civil engineering purposes over common roads, often greatly cut up, and even across country, under the most adverse conditions. He himself had without serious difficulty transported castings of eighteen tons weight over many miles of Irish bog road in the depth of winter and wet. Wherever existing siege artillery can be transported, there also could with equal facility the 36-inch mortars and shells be brought.

Finally, he reminded the meeting that what he brought forward was only the carrying out, to its legitimate scale and end, of the views as to attack by vertical fire promulgated by the great Carnot. Carnot's views had been dormant only because he had provided no projectile of sufficient weight and power to carry out his conditions.

In answer to the question as to the peculiar construction of these mortars in concentric laminæ with initial strain, Mr. Mallet stated, that small guns had been constructed long ago in that way, as well as some of the ancient bombards. The value of the principle involved was however not known. He believed he had himself been the first to recognise it, and certainly the first to carry it out practically (having in view its constructive importance) upon a large scale; while Dr. Hart, of the University of Dublin, had been the first to give an accurate mathematical investigation of the laws upon which such construction was based. The question of constructive peculiarities in the 36-inch mortars as designed by Mr. Mallet, entered but incidentally into his present communication—and that of priority not at all.

Several field guns had been latterly constructed on this principle, the most remarkable and successful being Mr. Armstrong's, of Newcastle. Mr. Longridge's wire gun apparently embraced the same principle, but there was no difficulty in showing practical objections, so insuperable and vital, as to render the construction of wire guns upon a large scale useless or impossible.

Evening Meeting.

Monday, 14th June, 1858.

Colonel the Hon. JAMES LINDSAY in the Chair.

The Chairman announced that Nine Members had joined the Institution since the 31st May, 1858.

LIFE MEMBER.

Stanton, Edward (C.B.), Brevet Lieut.-Colonel Royal Engineers.

ANNUAL SUBSCRIBERS.

Barstow, George, Major Roy. Art.
Sturgeon, Chas., Ens. late 24th Regt.
Willes, George O., Capt. R.N.
Allen, William, Capt. R.N.
Lysons, D., Col. Assist. Adj. General.
Hare, Edward H., Ens. 11th Regt.
Bowles, Charles O., Col. Oxford Mil.
Isaake, Jas. late Adj. Army Works Corps.

INCREASED SUBSCRIPTIONS.

Baird, John (M.D.), 1st Class Staff Surg. . . .	£1	0	0
Dalrymple, Lord, Capt. late S.F.G.	1	0	0
Saxe Weimar, H.S.H. Prince Edward of, Col. Gr. Gds.	1	0	0

LIBRARY.

Journal of an Officer. 8vo. London. By Captain Humbly. *Presented by the Author.*

A Plan of Lucknow and the adjoining Country: showing the late operations there. Sent to J. Crawford, Esq. by General Sir Colin Campbell, G.C.B. With a descriptive Letter. *Presented by J. Crawford, Esq. F.R.G.S.*

Rennie on the employment of Rubble Béton or Concrete in works of Engineering and Architecture. Pamp. *Presented by G. Rennie, Esq. C.E.*

For obtaining a uniform decimal system of Measures, Weights, and Coins. Pamp. London, 1858. *Presented by the International Association.*

Experiments made in the River Thames, with a view to discover a method for ascertaining the direction of Currents. Pamp. 1809.

Observations relative to the Spire Buoy. Pamp. London, 1798.

Memoir explanatory of a Chart of the Coast of China, and the Sea Eastward, &c. Pamp. London, 1811. *Rear-Admiral Saumarez.*

Lithographed Portrait of Mrs. Watson. *Presented by Mrs. Watson.*

Professional Papers of the Corps of Royal Engineers. Vol. VII. New Series. *Presented by the Editor of the Royal Engineer Corps Papers.*

Map of Oude. *Secretary of State for War.*

Collections of the Surrey Archæological Society. Vol. I. Part 2. *Presented by the Surrey Archæological Society.*

A few Remarks on our Naval Organization. Pamp. 1858. By Lieut.-Colonel Alexander, C.B. *By the Author.*

MUSEUM.

Model of a Steam Floating Battery for Coast Defences, invented by G. Rennie, Esq., C.E. *Presented by the Inventor.*

Eight Proofs of Medals granted for Indian Campaigns, viz. Punjab, Sutlej, Jellalabad, Pegu, first Burmese, Meeanee, Kelat, Candahar. *Presented by the Hon. East India Company.*

Models illustrative of the Arts of Camp Life. *Presented by F. Galton, Esq. Hon. Sec. Roy. Geo. Society.*

Model of portion of a Steam Frigate, which partly embodies the system proposed by Mr. G. Rennie for Floating Batteries, *i.e.* by protecting them with iron or steel plates on the curve or resiliance principle. *Deposited by G. Rennie, Esq. C.E.*

ARMOURY.

Sealed Pattern Helmet, as worn by the Dragoon Guards in 1812. *Presented by Messrs. Almonds, St. James's Street.*

ON THE IMPROVEMENT OF THE RIFLE, AS A WEAPON FOR GENERAL USE.*

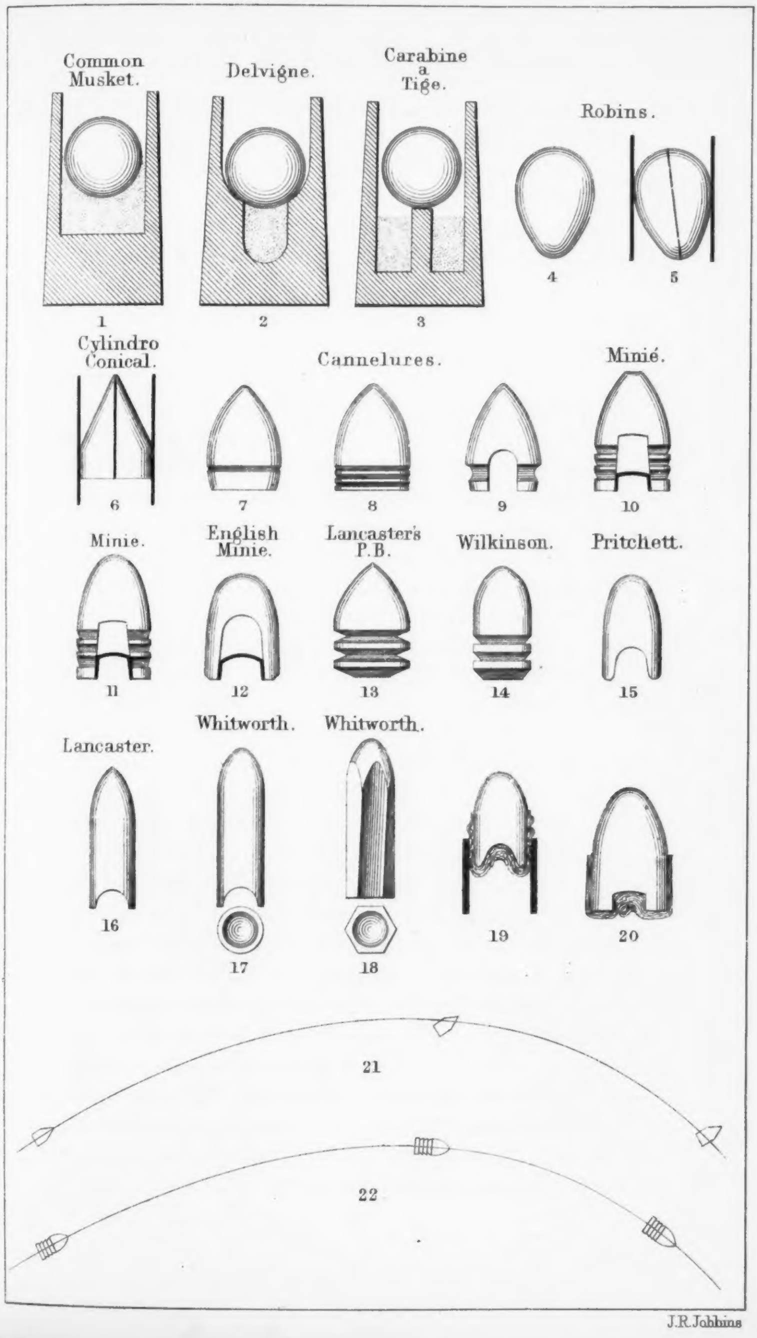
By Lieut.-Colonel LANE FOX, Grenadier Guards.

The Chairman said,—The business of this evening is the reading of a paper by Colonel Fox, of the Grenadier Guards, on the improvement of the Rifle as a weapon for general use. Upon the science of the rifle and projectiles, as upon most other sciences, there are differences of opinion; we have already had in this Institution several papers read upon this subject, both during the past and present year. The gentlemen who read these papers treated the subject in different ways, each in a manner calculated to promote the improvement and perfection of the arm. As there was an occasional difference of opinion with regard to the practical effect of the weapon and the projectile, the Council have selected this evening

* We were in error in stating in note, page 144, Vol. II. that the subject of the Minié expansion system has been since treated of by Colonel E. C. Wilford. It was merely intended to convey the information to the members that, in a subsequent Number, a Lecture relating to and connected with "The Rifle," had been delivered by him.

for the purpose of receiving a paper upon the subject, and afterwards having a discussion upon the practical effect of the various systems and theories which have been brought forward. It has been asked, Who is to be the judge upon such an occasion? Now that is the point which I wish to arrive at. I wish it to be understood that no judge is required; it is exactly what we want to avoid. One of the objects of this Institution is to create discussion. At some of our meetings a discussion upon inventions may be brought forward, and at others upon the practical effect of inventions; for by discussion upon such subjects science may be advanced, and the service of the country may also be benefited. It would be foreign to our objects that any decision should be given here upon opposing schemes; but we wish to afford the opportunity to scientific officers to display their theories and improvements, and we invite discussion upon the merits of their inventions. Colonel Fox, who has kindly come forward to read a paper upon the Improvement of the Rifle, has long directed his energies to this important subject. I am perfectly aware that about six or seven years ago, in the late Lord Hardinge's time, Colonel Fox laid plans before him, which were the origin of the establishment at Hythe. The original system was, in fact, devised by Colonel Fox, and is in the main the system now pursued at Hythe. The code of regulations has, no doubt, like all other systems after they are put in practice, been adapted and improved in the details; but great credit and much merit are due to Colonel Fox for having originated a system which has led to such valuable results. I have great pleasure in introducing Colonel Fox to the Meeting. He will now be good enough to proceed with his paper.

COLONEL FOX.—In some of the Lectures lately delivered at this Institution, several important questions were raised respecting the theory of the construction of rifled barrels and bullets, and the Council of the Institution, considering that advantage might accrue to the service by a discussion in which all those gentlemen who have at various times been engaged in the experiments and trials with small arms might be invited to take part, have done me the honour to request I would commence the proceedings of this evening, by giving a brief account of the history of the rifle and of the experiments and trials which


Common Musket.
Delvigne.
Carabine a Tige.
Robins.
1
2
3
4
5
Cylindro Conical.
Cannelures.
Minié.
6
7
8
9
10
Minie.
English Minie.
Lancaster's P.B.
Wilkinson.
Pritchett.
11
12
13
14
15
Lancaster.
Whitworth.
Whitworth.
16
17
18
19
20
21
22

J.R.Jobbins

have accompanied its introduction into the English army. This I shall endeavour to do, to the best of my power.

The remarks which I am about to offer are extracted principally from a private journal which I have kept during the course of experiments in which I have been engaged at Woolwich, Enfield, Hythe, and Malta, during six years, commencing in 1851 and ending in 1857.

It would be foreign to the object of this discussion, and quite beyond the limits of the time afforded me, that I should give an account of all the inventions which have been patented.

But, out of all the numerous contrivances which in successive ages have been put forward for the improvement of the musket, some few may be taken to serve as links in the chain of progress, whilst others have branched out of the main line, and contributed nothing of permanent utility. In tracing the history of the rifle through its various phases, I therefore propose to confine my remarks to what may be considered the main chain of improvement, disregarding all those varieties which, however ingenious in themselves, have embodied no principle of practical benefit to our own times, nor served as the stepping-stones to further improvement.

My subject necessarily breaks in upon the history of missile weapons, at a comparatively recent date.

The common musket, or hand fire-arm (fig. 1,) which, from its first invention in the middle of the 15th century to the time of its discontinuance in 1854, underwent no material change in the main principle of its construction, consisted of a plain tube or barrel.

At one time during the 15th century projectiles were employed with these arms, and hand-cannon, of the same elongated form as the bolts or quarrels which had been previously used with the cross-bow. But the great inaccuracy which resulted from the use of this description of missile, gave rise to the universal adoption of spherical bullets, which have continued in use both in hand fire-arms and cannon, until within the last few years.

The inaccuracy of these elongated projectiles arose from the fact, little understood at the time, of the enormous force opposed by the atmosphere to their passage through the air, at the great velocity communicated to them by the new weapons; and, as it was im-

possible to ensure their points continuing to the front throughout their flight, these bullets (offering a greater surface on their sides than at their extremities) met with an unequal pressure of the atmosphere as they turned over, and often presented an oblique surface to the condensed air in front of them, by which means they were deflected to a considerable distance from the point aimed at; whereas, the spherical bullets offering no greater surface on one side than another, it mattered little which of their sides came foremost. Their flight was therefore less influenced by their rotations, and for this reason the sphere must ever continue to be the best form of bullet to be fired out of a smooth barrel.

But the spherical bullets were also very uncertain in their fire, owing to the large amount of windage which was necessary with these arms; the latest pattern employed in our service being from this and other causes inferior to the long-bow, both in accuracy and in many other qualities. The large amount of fouling resulting from the residuum deposited upon the sides of the barrel by the discharged gunpowder rendered it necessary to make the ball much smaller than the bore, otherwise after much firing the bullet would not enter the barrel. Lord Orrery, who lived in the middle of the 17th century, mentions that in his time a large proportion of the shot in action rolled out of the barrel before firing; this led to the men being ordered to bring their firelocks to the recover before presenting; a motion still retained in some services. They were also ordered to ram grass or tow into their barrels. Peppercorns and grains of coarse powder were also used to wedge the bullets into the barrels, and many other expedients were resorted to, to obviate the inconvenience and inaccuracy resulting from the excess of windage.

Of these expedients one is especially deserving of notice, as affording a link between the old musket and its successor, and leading by an intermediate step to the introduction of rifled barrels.

About the end of the 15th century, not more than fifty years after the invention of hand fire-arms, fowling-pieces were constructed in Germany with grooves running straight down the sides of the bore. The barrels were first bored round, after which from five to six shallow angular grooves were cut down the sides of the bore, by

means of which it became a polygon, closely resembling the form lately proposed in this country by Mr. Whitworth. These grooves had no other purpose than to receive the fouling which oozed into the angles of the polygon, as the bullet was rammed down. The ball used with these fire-arms was of the same size as the bore before the grooves were cut, the circumference of the bullet, fitting tightly up to the sides of the polygon, caused it to be retained there when charged, and, on the discharge taking place, to glide out of the bore with an even movement; whereas bullets with which considerable windage was allowed were often deformed by striking against the sides of the barrel during their passage out of it, and sometimes left the barrel at some uncertain angle with the axis of the piece. It is evident that increased accuracy must have resulted from this system of grooving, as most of the causes of uncertain shooting which take place in the barrel were done away with. Still, as nothing had been done to preserve one side of the bullet foremost during the flight, it must have met with considerable deflection from the unequal pressure of the atmosphere after it left the barrel. For, although a bullet may be round, yet it cannot be truly homogeneous, or of uniform sphericity, on every side, especially in cast bullets, in which a vacuum usually occurs on one side, causing the centre of gravity of the bullet to be placed on the opposite side of the centre of its figure; and when the centre of gravity, and the centre of figure, do not coincide, the bullet will experience a disturbing rotation which will influence its passage through the air.

It has been found, by experiments which have lately been conducted in this country and abroad, that eccentric shot invariably deviate towards which ever side the centre of gravity rests when the shot is placed in the barrel. If it is placed to the right, the deviation will be to the right; *vice versa*, if to the left. If above, the range will be increased; and if below, it will be diminished.

The limits of the time afforded me deter me from entering more fully upon the interesting subject of these rotations. The subject has, however, been ably treated upon at this Institution on a former occasion, in a lecture delivered by Colonel P. J. Yorke, F.R.S.*

The rifle (if such it can be called) appears to have continued in

* See Appendix, page 489.

this imperfect state until the year 1520, when Koster, of Nurenburg, began to give his grooves a spiral twist; the twist making a little more than a whole turn in the length of the barrel; so that the bore in reality resembled a female screw, varying from the ordinary fabric of screws only in this, that the threads or rifles were less deflected, and approached nearer to a right line. The ball was made a little larger than the bore of the piece before the grooves were cut, and, being therefore too large to go down of itself, was placed on the muzzle, and forced home by a strong rammer, impelled by a mallet. By this means the zone of the bullet which was contiguous to the piece was made to take the shape of the grooves, so that it became a part of a male screw, exactly fitting the indents of the rifle. When the piece was fired the bullet was constrained to unscrew itself, the zone of the bullet following the sweep of the rifle, so that it received a rotatory motion upon the axis of the piece, and, on leaving the barrel, continued to whirl round an axis which was coincident with the line of its flight.

The advantage of spinning projectiles was not a new discovery; it had long been customary to place the feathers of arrows in a spiral direction, so as to cause them to turn round in the air; and it is probable that this circumstance may have first given rise to the idea of spinning the rifle bullets; but it is certain that very erroneous ideas prevailed for some time as to the nature of the advantages to be derived from this practice. Some supposed that the grooves, by increasing the friction, caused greater resistance to the action of the powder, and produced a more perfect inflammation; others imagined that the bullet, by compounding its circular and revolving motion, bored through the air, and thereby overcame its resistance with greater facility, and produced an increase of range. They found they could hit a mark at a much greater distance than formerly, and they not unnaturally attributed to increased range what was in reality owing to increased accuracy.

This was the state of knowledge on the subject until 1748, when Robins set aside these false notions, by proving that no increase of range could possibly result from the use of rifled barrels, the advantages of which lay solely in regulating the flight, and producing accuracy at distances at which bullets fired out of an ordinary

smooth bore could never be traced; and the manner in which this was accomplished was assumed to be by obviating the disturbing rotations before mentioned, and preserving the same side foremost throughout the flight.

He first illustrated his theory by means of a top, which he observed could never by any possibility be balanced upon its peg in any other manner than by spinning it on its axis, in which case it assumes the vertical position naturally, and maintains it as long as the spinning continues. The subject, however, will be more clearly explained by applying Robins's theory to the action of a floating ball. If a wooden ball is made excentric, by weighting it on one side with lead, so that the centre of gravity is thrown to that side, and it is then floated upon the water, it will be seen to turn round according to which ever side the centre of gravity preponderates until it rests at the lower side.

Although the turn thus made by the ball in the water is not precisely similar in cause or effect to that which produces the disturbing rotation of a ball during its flight in the air (but is in fact the reverse of it), still there is sufficient analogy between the two to serve our present purpose of explaining the effect of the spinning motion imparted to projectiles; inasmuch as both are produced by the excentric position of the centre of gravity, and the same means which are found effectual in preventing the one will also serve to obviate the other.

Now it is found that, by spinning the ball upon any axis, whatever may be the position of the centre of gravity, it will maintain nearly the same relative position around the axis of rotation as long as the spinning continues; nor will it descend towards the lower side until the rotation has begun to slacken, or has entirely ceased. If we examine the cause of this, we shall find that, although the centre of gravity is not exactly upon the axis it spins on, yet this irregularity cannot instantly cause the ball to turn according to its natural effort, because, during one revolution, the centre of gravity preponderates on every side of the ball, and thereby raises it as much in one place as it is depressed in another; wherefore, applying this to the motion of projectiles, it is evident that the effect of the spinning motion produced by the action of the grooves will be to

remove the evils arising from imperfect homogeneity, producing a virtual equality of density on every side, and thereby preventing any disturbing rotation from taking place, and preserving the same side foremost throughout the flight.

But, besides this negative advantage of preventing any disturbing rotation, Robins perceived that the motion thus given to the bullet would be in itself a source of accuracy, by correcting the irregularities of its flight at each revolution. Having calculated the resistance of the air to be far greater than had ever been contemplated before his time, he saw that the enormous force, which within the space of a few hundred yards could overcome by its direct action the great velocity of the bullet, would by its oblique action easily divert it from its proper path; and that, although the same end of a bullet might always be presented to the front, still, as it would be impossible to ensure perfect sphericity (it being as difficult to construct a ball of perfect figure, as it is to make it of equal density), one side of the half-sphere which is offered to the air must always offer a greater surface than the other, which, although it might be imperceptible to the eye, would nevertheless create deflection, by causing an unequal resistance of the atmosphere; but, by a rotation which is imparted to a bullet upon an axis coincident with the line of its flight, this imperfect side must constantly be presented to the air in opposite directions, and the deflection which would be caused by its position on one side would instantly be corrected by its transfer to the opposite side; so that the resistance on the foremost hemisphere of the bullet would by this means become equally distributed round the pole of its circular motion, and act with an equal effort on every side of the line of direction. From these considerations, it follows that the effects of the rotation in question are two-fold, producing a vertical equality both of density and form, and by this means rectifying the accuracy of the flight.

"The motion of a rifled projectile may be easily understood by considering the slow motion of an arrow through the air. For example, if a bent arrow, with its feathers not placed in some degree in a spiral position so as to make it revolve round its axis as it flies through the air, were shot at a mark with a true direction, it would constantly deviate from it, in consequence of its being pressed on one side by the convex part opposing the air obliquely. Let us now suppose this deflection in the flight of 100 yards to be ten yards. Now if the same arrow was

made to revolve round its axis once in every two yards of its flight, its greatest deviation would take place when it had proceeded only one yard, or made a half revolution; since, at the end of the next half revolution, it would again return to the same direction it had at first; the convex side of the arrow having been once in opposite positions. In this manner it would proceed during the whole course of its flight, constantly returning to the true path at the end of every two yards; and, when it reached the mark, the greatest deflection that could occur to either side would be equal to what it had made in proceeding one yard: equal to $\frac{1}{100}$ part of the former, or 3·6 inches; a very small deflection when compared to the former one. In the same manner, a cannon or musket ball which does not turn upon its axis deviates greatly from the true path, on account of the irregularities of its surface, which, though small, cause great deviation by reason of the resistance of the air."

From this it is evident that it is the resistance of the air alone which is capable of producing deviation; for, whatever may be the position of the centre of gravity, it cannot of itself produce deviation, except through the action of the air. Want of homogeneity may produce rotation, and rotation may, by the unequal pressure of the atmosphere, cause a deflection to one side; or the position of the centre of gravity may influence the flight of an elongated ball, so as to make it present an oblique resistance to the atmosphere; but, if it were possible to fire a bullet in vacuum, it might then be of any form, whether spherical, elongated, or of a deformed figure,—it might turn on end, fly sideways, or rotate upon any axis, without producing the slightest effect either on the accuracy or rapidity of its range; for it would then pursue its course with unabated speed throughout, in the true curve of a parabola, and would strike the mark with the same velocity that it had on leaving the muzzle of the gun. Hence it follows, that it is only by the action of the air that the theory of a rifled bullet can be properly explained.

But, besides clearing up what had previously been regarded as the mystery of rifled pieces, Robins by his researches arrived at two important discoveries, which, I believe I may say, laid the foundation of all subsequent improvements. The first of these was the advantage of using projectiles of an elongated form; and the second, that of so constructing them that their centre of gravity should lie near the fore part.

These two points occupy no *more* than ten lines of his celebrated treatise, but I shall endeavour to show, in the remaining portion of this paper, that through all the varieties the rifle has undergone,

(especially within the last few years,) these two principles may be traced as affording the only guide to the path of real progress. It will be found that all the systems which have been proposed in various countries, and the numerous forms of bullets which have been adopted, have succeeded only in so far as they were in accordance with the principles contained in the ten lines which Robins devoted to this subject; and I may add, that I believe his principles have not arrived at their full development even at the present time.

This subject will be considered more at length when treating of the elongated projectiles, which did not come into general use until long after the death of Robins. This celebrated man, to whose extraordinary genius gunnery owes so much, and to whose discoveries so little of comparative value has since been added, never lived to perfect his inventions; but, having bequeathed them to posterity, he concluded his investigations with the following remarkable prediction, which may be found in the last page of his treatise on gunnery. "I shall therefore," he says, "close this paper with predicting, that whatever nation shall thoroughly comprehend the nature and advantages of rifled-barreled pieces, and, having facilitated and completed their construction, shall introduce into their armies their general use, with a dexterity in the management of them, they will by this means acquire a superiority, which will almost equal anything that has been done at any time, by the particular excellence of any kind of arms; and will perhaps fall but little short of the wonderful effects which histories relate to have been formerly produced by the first inventors of fire-arms." Robins died with his pen in his hand in the year 1751, and it is a remarkable circumstance that in the year 1851, exactly a century afterwards, the Minié musket was adopted in this country for the use of the army. 28,000 were ordered by the Board of Ordnance, and the Duke of Wellington, in a letter confirming the Board's order, concluded by expressing his intention that every man in the service should be armed with the rifle musket.

But, before we arrive at the introduction of the rifle into this country as a weapon for general use, it will be necessary briefly to trace the progress of its improvement from the time of Robins.

Like many of those who have lived before their time, Robins

appears to have produced but little effect on the practice of his contemporaries.

For nearly a century after his death, and indeed it may be said from the time of the invention by Koster to the year 1828, (a period of no less than three centuries,) little improvement took place in the construction of the rifle; and the spherical bullet continued to be the only form employed. The difficulty and time required to load the piece, from the process of forcing the ball into the grooves, rendered it inapplicable as a weapon for the infantry generally; and, although the experience of the American war led this country (towards the close of the last century) to institute a corps of riflemen, the French abandoned it during the revolutionary war, considering it impracticable as a military weapon, and suited only to what they termed the phlegmatic constitution of an Englishman. Still however they acknowledged that their Chasseurs were by this means placed in an inferiority with those of other nations, and experiments were instituted from time to time to facilitate the loading, with a view to the re-introduction of the rifle into their service. No success however appears to have attended their efforts, until the war in Algeria, when the French began to experience, from the long-range matchlocks of the Arabs, inconveniences similar to those sustained by our troops in Afghanistan.

During the flying war kept up against them by Abd-el-Kader, they found that masses of their men were struck by Arab balls at distances where the French musket was apparently powerless; and this, they afterwards discovered, arose from the matchlocks of their enemies being fired at much greater elevation than was ever thought of by European troops.

In order to place themselves on an equality with their enemies, the French recommenced their experiments; and in 1828 M. Delvigne first showed how a bullet might be made to enter the piece easily, and quit it in a forced state (fig. 2). To effect this, he formed a chamber in the breech of the gun large enough to contain the whole charge. The ball was constructed to go down easily with a slight windage, and was prevented from touching the powder by resting on the edge of the chamber. It then received three smart blows of the ramrod, which was found sufficient to give it the im-

pression of the grooves, by compressing it in the direction of the axis of the piece, expanding it laterally, and thereby pressing it into the grooves.

It is unnecessary to enter into the details of this or the *carabine-à-tige* (fig. 3), both of which were identical in the object of their construction,—that of expanding the bullet by the blows of the ramrod. With both of these arms the spherical bullet was at first employed; but if any one will place a spherical leaden bullet upon an iron bench, and strike it with a hammer, he will readily perceive how much the ball must have been flattened before it could receive the lateral expansion necessary to enable it to take the grooves. It was in order to obviate the defective figure thus produced by the blows of the ramrod, that elongated balls of an oval form were first introduced into the French service, and these were subsequently replaced by the cylindro-conical bullets (fig. 6). Considered as an accessory to the use of elongated* projectiles, the introduction of cylindrical bullets must be regarded as a great step in advance; for, by constructing a portion of the bullet of such a shape as exactly to coincide with the sides of the bore, the axis of the bullet is by this means made to coincide with the axis of the piece, and to leave the muzzle in the direction of the line of fire—a point of the utmost importance in producing accuracy of flight; for when it is considered how much greater surface a lengthened bullet, the long axis of which is not coincident with the line of its flight, must present to the oblique action of the air, it is easy to understand why, up to the time of the introduction of cylindro-conical bullets, all attempts to employ the elongated form had been unsuccessful. (Figs. 5 and 6 illustrate this.)

Great increase of range and accuracy resulted from these improvements; but, during the experiments with these bullets by M. Tamisier, a curious circumstance occurred, which, by throwing light on the defects of their construction, led to still further improvements. Round the cylindrical portion of the bullet, an indented ring had been cut near the base, to receive the string which tied on the cartridge (fig. 7.) But an alteration in the shape of the cartridge having been made, this ring was done away with as unnecessary, and the result was a great diminution of the accuracy of fire.

The cause of the deviation experienced by these balls had been already investigated by Robins when considering the flight of spherical rifled balls; and was explained by him as follows. (Figs. 21 and 22.) The axis of rotation on which the ball spins by the action of the grooves remains parallel to itself throughout the flight; it follows, therefore, that when the musket is fired with an angle of elevation, the axis of rotation, which at first coincides with the direction of the flight, must depart from it more and more as the trajectory or line of flight becomes incurvated, forming with it an angle upwards. Thus, if the piece is fired at an angle of 25 degrees with the horizon, at the culminating point the axis of rotation (retaining the same position it had at first) will form an angle of 25 degrees with the tangent to the trajectory; during the descent, this angle will increase more and more, and the lower side of the ball becoming in fact the foremost side (and rotating in a direction which is from right to left), will give rise to the deviation already alluded to, under the head of disturbing rotations.

Although it was ascertained with certainty that the deviation of these bullets was invariably towards the right, opinions are not unanimous as to the precise manner in which these rotations operate in producing deflection. It would occupy more time than I am able to devote to the subject, to give a detailed description of the various theories which have been adduced in order to account for the effects observed in practice. All agree that they are caused by the angle formed by the axis of the bullet and the line of flight; but some attribute the deviation to the friction of the air, whilst others ascribe it to the unequal pressure engendered on one side of the bullet. A third theory denies that the axis remains parallel to itself throughout the flight, and attributes the deviation to other causes; and a fourth arrives at the conclusion that elongated bullets deviate to the right, whilst spherical and other short bullets deviate with the same rotation towards the left.

It matters little, as regards our present purpose, which of these theories is the correct one, for all conduct us equally to the point of our subject, which is the improvement of the bullet.

It was in order to obviate these defects that Robins proposed the use of bullets of an egg-like form (fig. 4), which, having their

centre of gravity in the fore part, would fly more truly in the line of trajectory, the lighter end being constantly forced by the resistance of the air into the path of the flight.

Monsieur Tamisier also attempted, with the same object, to increase the weight of the fore part; but, as he hit upon no other plan of doing so than by thickening and blunting the fore side, which rendered his bullet less adapted to penetrate the air, his endeavours were unsuccessful. He, therefore, had recourse to the expedient of re-establishing the indented rings, which had before been found so efficacious in preventing deviation. He increased their number to three, and sharpened the edges which were towards the front (fig. 8); considering that the friction which they offered to the air on the hinder part of the bullet would retard the flight on that end, and press it back into the line of flight.

Great success attended the employment of these indented rings, which were termed cannelures; but it is evident that their adoption was a step in the wrong direction, as they obtained, by retarding the hind part of the bullet, the same effects which ought to have been brought about by increasing the momentum of the fore part.

The great defect of the *carabine-à-tige* was the means employed to effect the expansion. The English authorities had early warning of the defects of this system. The first weapon of this description, which was sent over to this country as a sample, was one which was found loaded in the streets of Rome after the attack of the French. On unloading this it was found to contain two bullets, one of which had been inserted with the point downwards, showing how little reliance could be placed on a system of expansion which depended upon the manipulation of the soldier himself in the hurry and confusion of action.

It was to remedy this evil that the attention of military men on the continent was drawn towards the construction of a bullet which should expand itself, or, rather, which should be itself expanded by the action of the exploding gunpowder.

Mr. Delvigne was, I believe, the first who attempted this (fig. 9), by boring a cavity in the base of the bullet, which cavity being filled, as he conceived, by the gas of the exploded gunpowder, would expand the sides into the grooves of the barrel; and it is worthy of

being remembered, in connection with the Minié system, that in this he not only succeeded, but over succeeded, inasmuch as the gas was found to fill the cavity and burst the ball.

To remedy this, Monsieur Minié introduced the iron cup, or kernel (fig. 10), into the cavity, which was made conical, so as to diminish towards the interior, in order that the kernel, which exactly fitted the shape of the cavity, might be forced in by the explosion, and expand the lead in the manner of a wedge. The shape of the fore part of the bullet was also altered to conoidal form, which has been ascertained to be that which offers least resistance to the elastic properties of the air.

It is stated by those who advocate the Minié system that the expansion of the cylindrical portion of the bullet is effected by the action of the iron cup, which, being lighter than the lead, receives a greater velocity, and is therefore driven into the cavity before the inertia of the bullet is overcome. Others, amongst whom is Mr. Boucher, who, whatever may be the result of his experiments, has rendered a great service to the army by reviving the subject, consider this system a fallacy, and contend that the cup is never driven into the cavity, and that the gas, acting as much upon the base end of the cylinder as upon the cup itself, has no power to affect one more than the other, but drives the whole base of the bullet upon its fore part, and that in reality the cup is often forced out of the cavity by the compression of the lead around it.

In considering this subject, it is necessary to bear in mind that the force of the explosion does not act after the manner of force communicated by the blow of a mallet, or any other solid substance, but has the faculty of seeking its exit by the line of least resistance. The question, therefore, is whether the explosive gas, in overcoming the force opposed by the inertia of the bullet and the atmosphere, meets with less resistance by forcing the cup in, or by compressing the leaden cylinder. But, supposing that the cup *is* forced in, and that the base end of the cylinder is expanded into the grooves, will the cup then have the power of acting farther towards the fore part of the cylinder? for experience proves that the whole of the cylindrical portion of the bullet takes equally the impression of the grooves. It has also been proved by numerous bullets which have

been fired into clay with full charges, that a Minié bullet may receive the full impression of the grooves when the cup is not driven into the cavity at all.

In the March number of the "Journal des Armes Speciales" of 1842, which is in the Library of the Institution, Monsieur Tiroux, a chef d'escadron of the French artillery, observes, that, in the experiments with the Minié bullet conducted in France, the cup was seldom forced into the cavity, and that very often it was forced out of it, and remained in the barrel. This he, at the time, attributed to the action of the powder escaping by the windage compressing the sides of the ball, and closing them upon the cup.

In the experiments conducted at Woolwich, in 1850, the same thing occured—the cups remaining in the barrel of the gun. To remedy this, the cups were made deeper, and the same effects were not perceived in 1851. In 1852, at Enfield, the cups by some mistake were again made shallower, and, as the practice was conducted over water, it was oberved that the cups detached themselves from the bullet, and fell into the water not far from the piece. The defect was again remedied by lengthening the conical portion of the cup, so that it offered greater side surface to the action of the lead, and remained in the bullet.*

* I must, with all due deference, correct an error of date, which has appeared in Sir Howard Douglas's fourth edition of his "Naval Gunnery." It is there stated, in a note, that the shape of the culot or cup of the original Minié was a hemisphere, and that in 1854 an important improvement was made by the Commandant of the School of Musketry, by deepening the cup, and giving both to it and the cavity conoidal forms.

Having witnessed the greater part of the experiments which took place at Woolwich and Enfield, at the time of the introduction of the Minié musket, I can safely say that no such hemispherical cup as that described in the passage alluded to was ever in use in this country since the beginning of 1851. The cups always fitted the cavity; but having by mistake, at one time, been made too shallow, they were immediately corrected and deepened by the authorities at Enfield. Moreover, having in 1852 had the opportunity of examining Minié bullets in France, Belgium, Piedmont, and Naples, I can testify that in *none* of those countries were the cups formed in the shape of a hemisphere; but all had a cylindrical portion which fitted the sides of the cavity. Reference to the diagrams given in Monsieur Panot's work, published in 1851, will be a sufficient proof of the truth of my statement. It is necessary to correct this error, in order to show that no improvement has taken place in the construction of the Minié bullet since 1852, when it was superseded by the Pritchet bullet, under the authority of the Committee of Small Arms.

Before arriving at the more recent improvements, it will be well to consider further the defects of the Minié. I have already mentioned that Monsieur Delvigne's bullets were found to burst. In firing with Minié bullets without the cup, I have found that, with a particular form of cavity, the same thing will happen—the cylinder remaining in the barrel, pressed firmly into the grooves. The action of the gas in this case is evident; having filled the cavity, it presses equally on all sides, expanding the sides of the cylinder into the grooves of the bore, and at the same time forcing the head of the ball forwards; so that the head is separated from the cylinder at the place where the two join, leaving a crater-like fracture, shaped like an inverted frustum of a cone. In 1851, Mr. Wilkinson and myself made experiments with Minié bullets by filling the cavity entirely with cork. The same thing occurred. The cork counted for nothing against the enormous force of the explosion—the bullet bursting, as before, at the junction of the head with the cylinder, and planting the latter on to the sides of the bore. In firing with the cup bullet it has also been found that, when the cavity is not sufficiently conical to prevent the cup from being forced home, the gas filling the cavity will burst the bullet; or, if the cup is shallow, it is liable to be canted on one side, and thus admit the gas into the aperture. The same thing will occur when the wooden plug is used; as many as two or three cylinders sometimes remain in the barrel. A sufficient remedy for these evils is found to be by giving the cavity a more conical form; or, still better, by making it conoidal, as the cylindrical portion of the bullet is by this means thickened and strengthened at its juncture with the head, and the fracture at that place is prevented.

But, although the evils attaching to the Minié system have been prevented in the manner described, still, when the nature of those evils is considered, and the means by which they have been obviated, when it is also ascertained by undeniable proof that a Minié bullet will rifle itself without the assistance of the cup—the latter remaining fixed in the mouth of the aperture; and when in addition to this it is known, as I shall afterwards show, that a solid cylindrical bullet will rifle itself as completely as the most perfect form of Minié, we are forced to the conclusion that the action of

the cup in the Minié system, if it is not a fallacy, as stated by some, has certainly less influence in the expansion of the lead than has hitherto been supposed.

The real merit of the cup in the Minié consisted in its forming a frame for the cavity; by means of which the centre of gravity is thrown towards the fore part, so as to fulfil the conditions laid down by Robins, without flattening the point. With this form of bullet the cannelures are no longer necessary, and they have therefore been done away with in our service.

The Minié system has been taken up so warmly by the officers of the School of Musketry, that we have been told, in a recent lecture delivered at this Institution, that any attack on this system will be regarded by them as an accusation of imposture. It is difficult, however, to conceive how those officers can consider themselves affected by the failure of a system which was invented in France, and adopted in this country, some years before their names appeared in the field of experiment. When it is considered that no human eye ever has, or ever can, witness the action of a Minié cup under the influence of a full charge of gunpowder, and that all ideas on the subject must be merely conjectural, it is evident that the truth in this matter can only be arrived at by hypothesis; and when it is also shown that another distinct principle has since been discovered to produce the expansion of all elongated leaden projectiles, it is evident that even M. Minié himself may have been led into error, without incurring the suspicion of any but the purest motives. The question can only be decided by the aid of experiment, and this has been done by Mr. Boucher, in a manner that testifies to the attention he has devoted to the subject, and entitles his opinion to every consideration.

Before proceeding further, however, I must remark upon one of Mr. Boucher's experiments, conducted with barrels of different lengths, which has reference to the expansion of the bullet, and the manner it is acted upon by the air in the barrel.—(See page 149 of this volume.

This experiment of Mr. Boucher is important in proving how great is the effect produced on the expansion by the resistance of the air; but I would venture to doubt the conclusion which he

arrives at—that the expansion is gradual, and not instantaneous, or nearly so; for it must be observed that, whereas in practice his experiment was conducted with barrels of *different* lengths, in theory he argues as though he had traced the expansion of the bullet through its various stages in a barrel of the *same* length.

Now, when it is considered that that expansion is caused by the column of condensed air in the barrel, it is evident that the extent of that column, and its action on the bullet, must within certain limits be affected by the length of the barrel,—in short, that within certain limits the reduction of the barrel will reduce the pressure upon the charge. It is found that barrels of the ordinary length, after constant firing, wear away in the shape of a ring at about an inch in front of the resting-place of the bullet before discharge. This is supposed to mark the point of expansion, where the foremost portions of the gas, being arrested by the base of the bullet, are thrown with great force upon the sides of the bore. The cause of this may be explained as follows:—The ignition of the powder being gradual, and not instantaneous, the bullet moves from its place with a gradual though rapidly-increased movement, and the expansion is not effected until a sufficient portion of the column of air in front of it is condensed to its utmost limits. The bullet is then expanded, and the solidified portion of the column of air acquires the same velocity as the charge, and helps to drive the remaining portion of the air out of the barrel. From this it would follow, that, in accordance with the effects observed in the experiment referred to, the reduction of the barrel would produce no effect until it began to cut into that portion of the column by which the first expansion is produced. Beyond this point the expansion would be diminished by every inch that was cut away, until it had been reduced to about half an inch from the bullet, when, *the expanding agent having been completely destroyed*, the bullet would leave the barrel in an unforced state.

To resume the history of the bullet, it is necessary to return to the system of expansion by the blows of the ramrod. In the experiments of 1850, Mr. Lancaster, in order to diminish the resistance offered by the substance of the bullet to the blows of the ramrod, and to facilitate the lateral expansion into the grooves, hit upon the

expedient of deepening the indented cannelures round the cylindrical portion of the bullet (fig. 13). These deep grooves, two in number, were filled with grease, and with the twine which tied on the cartridge; and the blows of the ramrod, in compressing the bullet lengthwise, and expanding it laterally, closed up the grooves, and forced out the grease, so as to lubricate the barrel.

Little advantage was derived from this construction, which, nevertheless, may be regarded as a step to improvement, inasmuch as it doubtless anticipated the form of, if it did not actually give rise to, Mr. Wilkinson's bullet, which closely resembled it in shape (fig. 14); with this very important difference, however, that Mr. Wilkinson, having reduced the bore of his rifle, discovered that a bullet of this construction would take the impression of the grooves by the action of the gas and atmosphere alone, without the blows of the ramrod. The stem of the bullet, enfeebled by the deep indents on the sides of the cylindrical part, gives way to the pressure of the gas behind, and that of the atmosphere before, added to the inertia of the fore part of the bullet. At the same time the grooves are closed up, and the grease is forced out upon the sides of the bore. Colonel Gordon, in his remarks on the experiments at Enfield in 1852, speaks highly of this system, which he says was equal to all others in accuracy, and exceeded them in the flatness of its trajectory at long ranges. It has since been tried in Germany, where it is stated to have been the best used, possessing great accuracy, a low trajectory, easy loading, and little fouling. The difficulty of constructing a cartridge which would enable this bullet to be used naked, that is, without any paper intervening between it and the bore, appears to have been the only impediment to its adoption in our service in 1852. This difficulty has since been overcome, as I shall afterwards show. Of all the improvements which have been suggested in the shape of the bullet, this is perhaps the greatest step in advance. We have here a solid self-expanding bullet, upon an entirely new principle, without any cup, cavity, or any of the drawbacks of the Minié system, easily constructed on service, and adapted to any system of rifling.

An important discovery was however made during the trial with these bullets. It was found that the head of the ball, which is in front of the circular indented grooves, received the rifles as well as

any other part of the bullet. This could in no way be attributed to the action of the cannelures, which it became evident were not necessary to the expansion of the lead. Acting upon this, Mr. Pritchett introduced a bullet, which since its adoption has gone by his name (fig. 15), consisting of a plain cylinder of lead, with a conoidal point, having a slight cavity in the base, which is for no other purpose than to send the centre of gravity forward, and to keep it within a reasonable weight. This bullet being adapted to be used with a cartridge, was adopted for the service with the Enfield rifle in 1853.

Thus, after all the ingenuity which had been expended in devising a method of self-expansion, after trials in which cups of various shapes, plugs of iron, lead, wood, horn, and other materials, had been successively attempted, it was found that a plain leaden bullet was that which most perfectly fulfilled the necessary conditions, at the same time combining them with the utmost simplicity of form and construction.

During the time I was first instructor at the School of Musketry, the trials between the Minié and Enfield musket left no doubt as to the superiority of the latter as a military weapon. Shortly after its adoption a great improvement took place in the shooting of the men, which the commandant of the establishment attributed in his reports entirely to the new arms; and reference to the annual reports will show that as many as 150 rounds were frequently fired out of the same barrel, without experiencing the slightest difficulty from fouling, notwithstanding that the arms were frequently left uncleaned during the night, in order to make the test severe. But during the latter part of the war, the Enfield rifle having been distributed to the men in the Crimea, and being probably in an extremely dirty or oily condition, difficulties were experienced in the loading. To remedy this, I afterwards learnt that it had been proposed at Hythe to reduce slightly the calibre of the bullet, and re-introduce the cup, and subsequently a wooden plug; in short, to return to the Minié system.

I no sooner heard of this retrogade step than (being then at Malta) I immediately caused trials with the Pritchett bullet to be made in the several battalions stationed there, in order to ascertain if, during

the great heat of a Malta summer, the same difficulty of loading would be experienced; and, if so, to ascertain if possible the cause. Out of 60 rifles fired in the several battalions, 15 (or exactly one-fourth) were rendered unserviceable before they had fired 60 rounds. The same difficulty was experienced with the Minié, but in a less degree.

In endeavouring to account for a result so much at variance with all previous experience, I enumerated in my report home of August 3, 1855, a variety of points which might contribute towards hard loading, such as bad gunpowder, bad oil, and so forth; and then proceeded to give more in detail the cause, which all who had been present at the trials concurred in thinking the principal defect.

The paper of the Enfield cartridge was of different texture from the Minié; it appeared to be finer, and when saturated with grease became like wet leather, and was very liable to crease. The external case of the cartridge, enclosing the bullet and charge, was not rolled tight enough upon the sides of the bullet: so that when the cartridge was put into the barrel, the paper, saturated with the grease in hot weather, began to crease, in the manner which was represented in a diagram that accompanied my report (fig. 19); and this no doubt increased as the bullet went down the barrel. In some of the charges which were afterwards punched out by the armourer, the paper was found to be rolled up into a kind of string. This, I said, would be quite enough to account for hard loading.

The base of the Minié bullet, I observed, is broader than that of the Enfield, and is also better adapted to hold the paper which is folded upon it; the ends being turned into the hollow cup, and in a great measure retained there by the shoulders or edges of the cup, as shown in a second diagram which I sent with my report (fig. 20). This is not the case with the Enfield, and when there is much pressure on the sides of the bore, from fouling or other causes, the paper is unfolded and drawn off the base of the bullet, which often slips down naked upon the charge. In proof of this, it was observed, in the several trials conducted at different places in the garrison, that, upon returning ramrods, the paper, which ought to have gone down with the bullet, frequently came out adhering to the

head of the ramrod, and was invariably creased up in the manner before described. The use of the bag cartridge, I added, would completely obviate these defects. I also observed, that the grease of the cartridges appeared to be of an unusually sticky nature; and I concluded my report by saying that I saw no reason to suppose the bullet did not expand sufficiently when forced by the explosion; otherwise the accuracy of fire would certainly have been affected by it.

I had afterwards an opportunity of testing the Pritchett with the cup ammunition, but without discovering any difference between the two systems, either in regard to fouling or accuracy; and it remained for some time a mystery to me, how it was that the exploded Minié system could obtain support in this country.

All doubt on the subject, however, was cleared up on my return to England, by finding that the cartridge of the wooden plug ammunition had been *choked*, that is to say, tied at the base of the ball, so as to prevent its creasing, and entirely to fulfil the conditions of the bag cartridge, which I had recommended in my report home; whilst that of the Pritchett ammunition was *not* choked.

This confirmed most fully the truth of my premises: but, if any further proof be necessary, it may be mentioned, that since then the plug ammunition has been used at Hythe with grease in which a proportion of wax had been mixed. In consequence of this, the practice fell off very considerably; showing the great effect produced by any objectionable substance intervening between the bullet and the bore.

But a crowning proof, in my opinion, that it is to the paper alone the defects in fouling and accuracy are attributable, has taken place within the last few weeks at Enfield, where solid leaden bullets have been constructed and used without paper; and the result has been that these bullets have not only shown themselves superior to the plug, but barrels which would have been rejected with the latter as bad barrels, have produced greater accuracy than has ever been obtained with the plug ammunition.

The employment of a naked bullet has been proved in the experiments of 1852 to be advantageous; the only difficulty being its adaptation to the cartridge, and this has been effected by enclosing

the grease within the paper, which latter is easily squeezed off by the soldier in loading. The grease is retained round the sides of the bullet by means of shallow cannelures. I have seen both the diagrams of practice and the bullet, the latter of which greatly resembles the Pritchett; but I will not trespass upon the province of that department by giving any further description of it. Suffice it to say, that it promises to lead to important results.

The re-adoption of the cannelures for the purpose above mentioned, is a remarkable illustration of the rule, which has held good throughout the whole history of the rifle, that the path of improvement has been stumbled upon, and followed by those who were in search of something widely remote from it. These cannelures, at first established to act like the feathers of an arrow, were subsequently employed to weaken the stem of the bullet, and are now re-adopted as a receptacle for the grease only; showing that in all things necessity, rather than foresight, has been the mother of invention.

But another collateral advantage deserves to be noticed in connexion with the solid bullet. I allude to the facility with which it is constructed on service. An instance of this occurred at Lucknow. I received a letter from Major North, of the 60th Rifles, who had acted as Deputy Judge-Advocate to General Havelock's force. On the arrival of that force at Lucknow, the ammunition of the Enfield rifles failed, and the rifle was in consequence taken away from three of the regiments which were armed with it, and replaced by the smooth bore. Having been for some time employed as a musketry instructor, Major North immediately proposed that men from every regiment should be told off, for the manufacture of cartridges. The idea was at first ridiculed, but, persisting in the feasibility of his proposal, General Havelock at last desired him to begin. There was but one bullet mould in the force, a private one, belonging to an officer of one of the regiments. Having enlisted this officer with his mould, others were made after it by the regimental armourers: the natives were taught; 2,500 cartridges per day were manufactured; and at the end of a month, after 72,000 rounds had been constructed, the three regiments received back their rifles. This, it will be admitted, was an important service rendered to the force,

under the circumstances in which it was placed; and, had the three regiments been instructed in the use of their rifles, still more important results might have attended it. On Major North's return to England, I wrote to him to ask, "How did you manage to construct the cups or plugs in the necessary proportion?" He answered, "It was the Pritchett bullet, which, being solid, required no such accessories; if we had been dependent on cups or plugs, I do not know how we should have managed."—I think a lesson might be learnt from this. Our whole army is now taught to make cartridges. Of what use is this instruction to them, if they are neither provided with the means of making them, nor is their ammunition of such a nature that it can be constructed with facility in the field?

But, whatever weight may attach to this consideration, I should be sorry to rest an argument for the employment of a solid bullet upon such grounds, were not its advantages in point of accuracy, and other respects, sufficiently established both by theory and experiment.

If any further doubts on the matter should still exist, it is only necessary to quote the reports which have been published of the practice of the Whitworth rifle. Nearly every one has heard of the extraordinary and almost incredible performances of this arm. It is stated, that at 800 yards it exceeds the practice of the Enfield at 500. Now what is the shape of the bullet employed with this rifle? (Fig. 17.) Two forms have been submitted by Mr. Whitworth; neither of them have either cup or plug; and that which is proposed for the use of the army, is neither more nor less than the solid Pritchett bullet; differing from it only in *length* and *diameter*. Like the Pritchett, it receives its expansion by the opposing forces of the gas and atmosphere, the particles being what is technically termed upset, and the cylinder moulded to the form of the barrel.

The Whitworth rifle brings us at once to the question of *bore*. The advantage of reducing the bore of a rifle has long been known to rifle makers; and the principle on which it is based is extremely obvious. The resistance of the atmosphere is in proportion to the size of the fore end of the bullet which is presented to it, but the momentum, or power to overcome the resistance with a given

velocity, is in proportion to the weight of the bullet, which depends upon its length. No one would think of taking off the points of an arrow, and using them without their shafts; and, by the same reasoning, the longer a bullet is in proportion to its diameter, provided its point is kept to the front, and it receives a sufficient velocity, the greater will be the range. As long as the spherical bullets continued in use an increase of bore was desirable, because in a sphere the weight increases in a larger ratio than its diameter; but, since the employment of elongated projectiles, all improvement in the construction of the musket has been accompanied by a reduction of bore. On the adoption of the Minié, it was reduced from ·760 to ·702; on the introduction of the Enfield, it was reduced to ·577; and Colonel Gordon, in his remarks upon the experiments of 1852, which had been conducted under his superintendence, comments upon the advantages of this reduced bore, as more easily adapting itself to the improvements which are constantly being made in the form and composition of elongated projectiles.

At this time Mr. Wilkinson proposed a further reduction to ·530, and Mr. Lancaster, either then, or shortly afterwards, proposed ·498. But a further reduction at that time was not desirable, as much difficulty had been contended with in overcoming the opposition to the reduction already made. This is more particularly shown in the evidence of Mr. Westley Richards, before Parliament, in 1854. But since then Mr. Whitworth, conducting his experiments with the aid of a grant from Parliament, and acting in concert with the School of Musketry, has adopted a smaller bore than that originally suggested by the gunmakers. The Whitworth bullet differs from the Pitchett only in this—that its diameter is smaller, and the regulation weight is made up by adding to the length the mass of lead which is deducted from the periphery; thereby producing a form better calculated to meet the resistance of the atmosphere, and which, independently of the system of grooving, would produce greater accuracy, velocity, penetration, and range. In the experiments at Hythe, the Whitworth small bore has been tried against the Enfield large bore, and current opinion has attributed to the improvement of system the superiority which all experienced persons had foretold would result from the diminution of bore.

Whether or not it is entirely attributable to this cause, can only be proved when it has been fairly tried with the Enfield.

Any invention emanating from Mr. Whitworth must carry with it all the weight, and receive all the attention, which is due to his eminent abilities as a mechanician, but at the same time I am bound to add, that I am informed upon good authority that an Enfield rifle has been made of the same bore as Mr. Whitworth's, and has been found to equal or exceed it in range and accuracy.

Besides the question of bore, must also be considered the accuracy with which these arms have been constructed, for not only are the barrels bored out of a solid bar of steel, but even the beds of the sights have been cut out of the same block, instead of being soldered on to the barrel, as in ordinary rifles. Mr. Whitworth is the well-known inventor of a most ingenious machine, by which small distances, and especially gauges, are measured with a degree of accuracy that has never before been attainable. The difference between a good and a bad rifle of the same construction depends greatly on the accuracy with which it is gauged; and it remains to be proved, whether the few samples of this arm which have hitherto been used may not owe much of their perfection to a degree of accuracy and cost bestowed upon them, which can never be attainable in arms manufactured wholesale for the army.

These remarks are in no way meant to disparage Mr. Whitworth's system. I am too well aware of the little value of any merely theoretical conjecture, to give any opinion on the merits of a system which I have not seen practically tested. Indeed, so far as I can judge from the brief inspection Mr. Whitworth was so kind as to afford me of his rifle, I should say, that if ever there was a system which would bear the test of a fair trial it is the one now under consideration; and I have little doubt that Mr. Whitworth himself is the last person who would wish that the credit of his invention should rest upon such mention as has hitherto been made of it; for until it has been fairly tried, and placed on an equality with other arms, all premature laudation, from whatever quarter emanating, must tend rather to damage than promote the success of his undertaking.

Another advantage of reducing the bore of a rifle, is the greater

facility which it affords for the expansion of the bullet. It has already been mentioned that, in Mr. Wilkinson's system, indented cannelures were cut to diminish the substance of the cylinder. In the Minié, the same effect is produced by the aperture running through the centre of it; and, although it is found that with the small bore adopted by Mr. Wilkinson the cannelures are not absolutely necessary, still there can be little doubt that the more the diameter of the cylinder is reduced, and its substance diminished by the reduction of the bore, the more perfect the expansion will become.

The question of rifle-grooving remains to be considered. It has been already said, that, at the time of the first invention of the rifle, the increased friction opposed by the grooves was considered to be its great merit. Robins was the first to refute these misconceptions, by showing that the friction was in fact the great defect of the rifle, and the principal difficulty to be contended with in the improvement of it; and he laid down the principle, never to be lost sight of in the construction of rifles, that the grooves should be no deeper than is necessary to give the bullet sufficient rotation.

As the grooves were made shallower they necessarily became broader, otherwise the portion of lead pressed into them would not be of sufficient substance to ensure the turn of the bullet.

In order to convert the old smooth-bore into a rifle musket, (and as the thinness of the metal at the muzzle of these arms did not admit of their being grooved to the usual depth,) the French made their grooves shallower at the muzzle than breech. This was found to give increased accuracy, and was therefore adopted as part of their system, and the same principle was extended, by making them also broader at the breech than muzzle.

In 1851, experiments conducted in Belgium proved that greater initial velocity was produced by the new system of grooving, but the difficulty of cutting these grooves deeper at the breech than muzzle induced them to construct their barrels slightly conical, so as to produce the same effect—that of squeezing the ball more tightly as it approached the muzzle. They reported favourably of this method, but the recoil was much increased by it. In England this system never received a very extended trial. The difficulty of constructing these grooves had more weight than it deserved in a

country like this. In 1852 I found a machine in operation at Turin for the construction of these grooves, which closely resembled one which I had contrived and submitted to the authorities the previous year, and by which the increased depth at the breech was cut by means of an excentric bit, which was forced out by the twist of the boring-rod. As it is now proposed to re-establish the unequal grooves with the Enfield rifle, a few words on the subject of the advantages or disadvantages of the system may not be out of place.

The effects must be considered under the two heads of *accuracy* and *velocity*. The accuracy may be increased by tightening the hold of the grooves upon the bullet, and thereby more effectually preventing the possibility of stripping. The velocity may be increased by more effectually destroying all windage; but, on the other hand, it might be retarded by the increased friction which is produced by the pressure of the bore. These are points which can only be satisfactorily determined by experiment; but in all these matters it is important to bear in mind that, within certain limits, accuracy should give way to velocity, or to whatever tends to flatten the trajectory and produce a more grazing fire. When the circumstances under which the rifle is applied in the field are considered—the noise and confusion of action, the smoke, and above all the difficulty of judging distance, it may safely be said, that, with any rifle of the ordinary construction, the inaccuracy which will be due to the man, however well trained, as compared with that due to the imperfection of his rifle, will be as twenty to one, or a larger proportion.

If, therefore, the accuracy of the arm alone is the object to be attained by the proposed alteration, it is barely worthy of adoption; but in regard to velocity the matter is widely different, for velocity, when combined with such a form of bullet as to maintain it with comparatively slight diminution throughout the flight, produces a more grazing fire, and thereby diminishes the difficulty of judging distance. With the Enfield rifle, it is known that at the distance of 600 yards the bullet falls the height of a man in about 60 yards. A margin of 60 yards is therefore afforded at this range for the appreciation of distance, when firing at a man: the flatter the tra-

jectory, the more that margin will be increased. The imaginary perfection of the flight of the bullet would be a straight line; for, in this case, all judging distance exercises might be dispensed with, as the same sight would answer equally for all distances; and, although such conditions are impossible, still, the nearer the trajectory approaches to the straight line the greater will be the facility with which the rifle is employed practically in the field. An increase in the velocity of a projectile is therefore an object to be attained by every means possible.

Mr. Whitworth's system may be said to consist in an alteration in the number and shape of the grooves. Instead of three shallow grooves, with rounded edges, he employs six shallow angular grooves, so shaped as to form the bore into a hexagon.

Mr. Lancaster's system may be said to be an extension of the principle of broad shallow grooves, and may be described as having two opposite grooves, so broadened and extended as to run into one another, and form the bore into the shape of an ellipsis.

Mr. Lancaster's rifle has the very great advantage over all others of having no angles to accumulate dirt and fouling, and it is therefore much more easily kept clean. The great superiority of his rifles in this respect has been brought to my notice by having under my superintendence for instruction at Malta two companies of the Royal Engineers, which were armed with it. My conviction is, that throughout the entire service, and especially at places where soldiers are encamped near the sea, the angles of the grooves of our Enfield rifles are in a state of rust, which will show itself before long by a great diminution of accuracy. In the garrison of Malta, which consisted entirely of regiments from the Crimea, the accuracy of the arms was found to be in an inverse proportion to the time they had been in use; and in those regiments which had had their rifles longest, a large proportion were found to be entirely past repair, and were exchanged for new ones. Although it is true that the wear and tear they received in the Crimea is not a fair criterion of that which they would experience under ordinary circumstances, when the men beome more careful of their arms, still, it is evident that the subject is worthy of serious attention, as the ordinary examination of the head of the ramrod on parade is insufficient to

detect rust in those parts of the grooves which may escape the sweep of the cleaning rag.

Mr. Lancaster's musket was tried at Hythe in 1854, and was found to exceed all others in accuracy; but, having been tried again some time afterwards, the bullet was found to strip, or, in other words, to leave the grooves and quit the barrel without receiving the spiral twist, and on that account it was rejected. The reason for this was never clearly ascertained, but, in the absence of any better understood cause, it was attributed to the greater wear and tear of these arms; although, as the report stated, it was difficult to reconcile this view of the case with the fact that only 260 rounds had been fired out of them when the trial commenced.

Mr. Lancaster at the time attributed it to the use of wax in the grease of the cartridge, and subsequent experience appears to confirm the truth of this supposition. He also supposed it to be caused by a malformation of the bullet, which was easily rectified. The results of these trials have been made public by Sir Howard Douglas.

The reports from the School of Musketry were explicit in stating that, but for the defect of stripping, the Lancaster musket was superior to the others, both as regards accuracy and facility of loading.

It was, however, supposed to require that the cartridge should fit the barrel tighter than in other systems of rifling, owing to the shallowness of the grooves, or, to speak more properly, to the slight difference between the long and short diameters of the ellipsis; and this, it was considered, would render it unserviceable in the field, where ammunition is often dirty and defective. It has been proved, on the contrary, by the practice of two companies of Royal Engineers at Malta, where the ammunition was very inferior to that used at the School of Musketry, and was often in an almost unserviceable condition, from the dirt adhering to the grease of the cartridge, that, even with this defective ammunition, the Lancaster musket is superior to all others in the facility with which it is loaded after much firing.

Upwards of 200 rounds were fired out of some of these rifles without producing any deterioration, but on the contrary an increase of accuracy was perceivable. Although the bullet used was the

Pritchett, which is supposed by some to receive an insufficient expansion, no stripping worthy of mention occurred during the whole practice; and the average and final classification of both companies exceeded the highest previously obtained with the Enfield at the School of Musketry, even with non-commissioned officers training for the corps of Instructors of Musketry. It is therefore evident that the defect of stripping had by some means been remedied, and accordingly in my report I ventured to say, that the practice proved the Lancaster musket to be not only "not inferior, but if anything a superior weapon to the Enfield rifle;" and it justifies me in asking that it should be tried with the Whitworth rifle at the same reduced bore which Mr. Lancaster was one of the first to propose.

A few observations on elongated projectiles will conclude my remarks. It has been found by all those who have attempted to elongate the bullet beyond a certain length, that they have been obliged to increase the spiral of the grooves; otherwise, after a certain distance the bullet began to turn over, and fly with great irregularity. The cause of this is easily understood, when it is considered that all the bullets which have been employed of a very elongated form, were of such a shape that the centre of gravity is in rear of the centre of figure; or, if not in rear of it, but slightly in front of it.

The force of propulsion has its resultant in a line drawn through the centre of gravity, whilst that of the resistance of the air is in the centre of figure. If therefore the centre of figure is in front of the centre of gravity, the slightest irregularity will cause the bullet to turn over, or form an angle with the line of flight; and with a given angle of inclination the greater the length of the bullet, the greater the side surface opposed to the oblique action of the air. This can only be remedied by increasing the rotation, so that the error of inclination may be more rapidly corrected, and the bullet more instantaneously brought back into the line of flight.

But an increase of spiral can only be given to a rifle at a sacrifice of velocity. In bullets such as the Minié, where the centre of gravity is nearer the front, the air, instead of acting as a disturbing influence, helps to correct the flight by forcing the hind part of the

bullet into the line of flight. The rapid spiral is therefore unnecessary with these arms.

It would therefore appear advisable that some means should be devised to lighten the base end of the new projectiles, so as to place them on an equality with the Minié in this respect. It has been stated in Parliament that advantage has been derived from the use of iron hexagonal bullets with the Whitworth rifles. If so, and the wear and tear occasioned by the use of iron bullets is not found to be an impediment, I would suggest that by way of experiment they should be weighted at the fore part, with lead cast in at the point. The bullet might then be elongated, and the spiral perhaps diminished.

With the present spiral, it is probable that the hexagonal balls could never be used in military service, on account of the difficulty of loading; the bullet having to be, as it were, screwed down the spiral of the bore; an operation which, when foul, would probably give rise to all the inconveniences which formerly attached to that system of loading: but, with a diminished spiral, this difficulty might perhaps be obviated.

The same effects might, perhaps, be produced with the Lancaster and Enfield rifles, by hollowing the base of the ball, and inserting a wooden picket, of an entirely different shape from that now in use in the service, and having for its object merely to form a framework for the aperture by which the rear end of the bullet is lightened.

Mr. Boucher's bullet appears well adapted to the desired purpose, the aperture being closed up by an iron disc, so as to prevent its collapsing or bursting by the action of the gas. I can conceive no reason why this bullet should not be considerably elongated.

It is possible that bullets of the above-named construction might prove an extension of Robins's principle, and produce an increase both in accuracy and range. But, if no very material advantages are derived from them, the objections to a compound, and the difficulty and cost of construction, both in the arsenal and on service, would operate in favour of a solid bullet of the Pritchett form; which I will conclude by pronouncing the best principle of bullet ever yet introduced into this or any other service. Finally, I may observe, that I believe it is the wish of all those who are interested

in the improvement of the rifle, (now that a further reduction of bore is contemplated,) that all the various arms which at different times have been submitted to the authorities should be tried together, with a bore of the same diameter; in order that, the conditions of each being identical, it may then be possible to compare the systems, and select the best.

The reading of the paper gave rise to the following remarks—

Colonel Dixon, R.A.—I wish to make a few remarks. First, may I be allowed to allude to the opening remarks with which our Chairman prefaced the reading of the paper by Colonel Fox? I delivered a lecture last year which attracted rather more attention than it deserved, and there has been an unfortunate interpretation given to certain things said in that lecture; I should like now to repudiate every kind of feeling which some of the members of the School of Musketry have attributed to me, viz., that an attack had been made upon them. In the lecture that I gave here, I stated that it was a matter of opinion what arm, or description of arm, was best adapted to the line infantry soldier. The whole subject, as has been said by Colonel Fox this evening, has been a matter of argument from the earliest period from which we are acquainted with the history of firearms, and even now we have not arrived at anything like a finally-fixed arm. Everything is, I believe, in a state of progress, but nothing like perfection has been attained, I believe, yet. Everything that I have said as to the rifle, and also with respect to those in whose hands that rifle is to be placed, was of course matter of individual opinion. I said that the rifle was a delicate weapon, and I think that most of the gentlemen present will agree with me in that statement. I did not say that the rifle of 1853, which is in the hands of the troops, was *too* delicate a weapon; but I said that the rifle was a delicate weapon, and that the soldier, unless he were well instructed, would not make good use of the weapon. In those remarks I had no reference to, and it would have been highly indecorous in me to make any remarks as to the proceedings carried on at, Hythe. I believe that the system as laid down at Hythe has been productive of a very great deal of good. I think that there

are earnest men down at Hythe, and that they are all trying to develope the powers of the rifle by instructing the men in its use; and it was merely a matter of opinion which I enunciated as to whether an army of two or three hundred thousand men could be made marksmen in any reasonable period of time, taught to judge *their distances*, as well as made acquainted with the use of a delicate weapon. I said that the great object to be borne in mind was to instruct the soldier in the care of his arm as well as to teach him the use of it, as a rifle not cared for was worse than the old Brown Bess. I had not the slightest intention to hurt the feelings or to say anything derogatory to a single member of the School of Musketry at Hythe, men whose characters I respect, and I only ask of them that the opinions which I enunciated may be combated fairly, and by facts. I wish them success in what they are earnestly endeavouring, I believe, to carry out; and, as far as I am concerned, it is my wish, as far as the rifle can be perfected, to keep pace with their instruction. With regard to the lecture of this evening, there have been many points mentioned of exceeding interest, and which I think might be made the subject for separate discussion. I agree with Colonel Fox in many things. With regard to the experiments at Enfield (alluded to this evening) namely, the employment of a naked bullet, and thus doing away with that interfering medium, the paper, it will be a matter of great importance if we can succeed. I have made experiments for a considerable time with the naked bullet as against bullets with paper, and, so far, successfully.

Colonel Hon. A. Gordon, Deputy Quartermaster-General.—I beg to say that I entirely concur in what has been said as to the advantages to be derived from the naked bullet in preference to one with paper. It is almost evident that the naked bullet properly supplied with grease will fill the grooves of the rifle better than one which has the intervening substance of paper around it, and which cannot be applied with sufficient accuracy in the manufacture of the cartridge. It is evident that the paper cannot be equally placed around the bullet in consequence of the necessity there is for cutting the paper in the form of a trapezium. The only difficulty in 1852 and 1853 in introducing the naked bullet was, because it was thought very objectionable to have the bullet separated from the

powder, the established custom being to use it with a cartridge; and even in the rifle corps, where the bullet and the powder were made up separately, they made great objection to the system of having the bullet separated from the cartridge. Colonel Dixon has now, I believe, made great progress towards adapting the cartridge to the naked bullet; but it has not been tried, I believe, to any great extent yet. Colonel Fox's paper contains so much valuable matter, that it is impossible to go into the whole of it, but I subscribe to almost every word that he has said. His lecture shows the great pains that he has taken upon the subject, and great research. It is a very dry matter, but it is evident that he has paid great attention to the subject.

A gentleman representing Mr. WHITWORTH said, May I be permitted to say a few words with reference to some observations by Colonel Fox as to the Whitworth Rifle, and the attention bestowed on those arms, which were, I believe, experimented upon at Hythe, and subsequently at Woolwich? I think I may say, from my own observation, that, so far from their being arms upon which any particular attention had been bestowed, they were, I believe, the first military weapons that Mr. Whitworth had made of that length and of that peculiar nature. Mr. Whitworth will be glad to hear that the Enfield rifle has received that attention which may advance its excellence, and that it will be compared under equal conditions, and with more success than it has obtained before; and, so far from shrinking from, or wishing to avoid any trials with other weapons, it is that which he has been asking the Government to afford him facilities for doing. He is most anxious, I believe, to bring about a trial, and, as the Committee will meet soon again at Woolwich, we shall be able to obtain results which we hope will be more satisfactory than they have hitherto been, on account of the different conditions under which the experiments were made.

COLONEL GORDON.—With reference to the remarks of the gentleman who referred to Mr. Whitworth's rifle, I may add my testimony to his anxiety that his rifle should be tried in perfect comparison with others. I know that his great object is that his rifle should receive a fair trial with others, but he does not wish to press forward his own unfairly at all.

APPENDIX.

Wednesday, 21st June, 1854.

Vice-Admiral LORD RADSTOCK, C.B., in the Chair.

Col. YORKE, F.R.S., &c. "On Professor Magnus' Researches on the Deviation of Spherical Projectiles."

The principal and most important part of this lecture was derived from a memoir by Professor Magnus, a translation of which appeared in Taylor's Scientific Memoirs for 1853, p. 210. The lecturer stated that after reading this memoir it had appeared to him that the matter was peculiarly fitted to be brought under the notice of the members of the United Service Institution, as an instance of experimental and philosophical investigation applied to the solution of a problem of great professional interest. He had, therefore, through the kind assistance of Professor Tyndall, obtained from Berlin the most essential parts of Professor Magnus' apparatus, made under the superintendence of that philosopher. The following were stated to be the facts relating to the subject, which had been previously established by observations and experiments:—

1st. That the deviation is most distinct when balls are used whose centres of gravity are known not to coincide with their centres of figure. 2. That the direction of the deviation is determined by the position of the centre of gravity of the ball within the gun, *e. g.* when the centre of gravity is to the right, with reference to a person behind the gun, the deviation is to the right; when to the left, the deviation is to the left; when above the axis of the gun, the range is longer; when below, the range is shorter. The amount of deviation is said sometimes to be equal to one-sixth of the range.

In the experiments made with eccentric shot at Shoeburyness, the range in one instance of a 32-pounder, with a charge of 10 lbs. and an elevation of 12°, varied from 3,498 yards when the centre of gravity was above the axis to 2,598 yards when it was below. The greatest lateral deviation obtained here was with an 8-inch gun and 68-lb. shot, charge 10 lbs., elevation 10°: with the centre of gravity to the right, the range was 2,558 yards, and the deviation 181 yards; when the centre of gravity was to the left, the range being 2,332 yards, the deviation was 57 yards. The mean range in this example is 2,445 yards, and the mean deviation 119 yards, or 1-20th of the range. 3rdly. It has been shown, by firing at targets placed at different distances with eccentric balls, that the deviation increases in a greater ratio than the distance. This observation shews that the force which produces the deviation must be active during the whole course of the projectile.

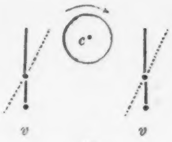
After adverting to the attempts, more or less successful, to explain the phenomena, which had been given by Robins, in his "New Principles of Gunnery,"

published in 1742, and lately by Lt.-Col. Piobert, in his "Traité d'Artillerie," and also to the failure of mathematicians to give any demonstration of the cause, and to the non-existence of any experimental investigation previous to the researches of Prof. Magnus, the lecturer stated that, inasmuch as the theory derived by Prof. Magnus from his experiments assumed a particular direction of rotation in the projectile with reference to the position of its centre of gravity, it appeared necessary to show that this direction was such as the theory required before entering on the experiments of Magnus. What this direction will be may be readily arrived at by considering the nature of the propelling force. This force, in the case of gunpowder, is derived from the sudden evolution of elastic gaseous matter in a confined space behind the shot, which, as is correctly expressed by common language, is blown from the gun. If then the shot has its centre of gravity eccentric with respect to its figure, it will, on being propelled by the pressure of the elastic matter, be made to rotate on an axis passing through its centre of gravity, and the greatest amount of action will be on that side of the axis of rotation which presents the greatest surface; it will turn on this axis in fact just as a vane would turn on its point of suspension. Thus, for instance, if a shot have its centre of gravity placed to the right, the anterior part of it will rotate *from* left to right. That this is really what takes place was shown by a simple experiment. A wooden ball of 2-in. diameter, having its centre of gravity eccentric to its figure, was suspended by a filament of silk against the mouth of a short horizontal tube of equal diameter; by means of a sudden puff of air produced by a kind of bellows, the ball was propelled about a foot or more from the mouth of the cylinder, and it was then seen to rotate as before described.

Passing now to the experiments of Magnus. Their first object is to determine the atmospheric pressure on different parts of the projectile. In order to this investigation, it may be assumed that the relations of pressure are the same, whether the projectile moves against the air, or whether the air is made to move against the projectile; this being granted, the desired phenomena may be observed by allowing the projectile to be stationary, while a current of air is directed against it, equal in velocity to that which the projectile in motion would have had.

Magnus then considers the different results of the motion of the air and of a spherical projectile. 1. When the air moves against a spherical body at rest, the motion around it is evidently everywhere the same. 2. If the sphere is made to rotate; in this case a portion of air in contact with the sphere is made to rotate with it. 3. The combined action of rotation and translation is considered, the axis of rotation being supposed perpendicular to the direction of translation. In this case, on one side of the sphere, the motion of the air generated by rotation is in the same direction as the translation, while the contrary is the case on the other side.

The principal apparatus used by Magnus consists of a brass cylinder about 1½ inch diameter, and 4 inches high, which represents the projectile: this is placed on a vertical axis, and can be made to rotate with considerable velocity by means of a common rotating machine. A current of air is produced by a machine with a rotating fan, like the patent blowers often used in London, except that the nozzle which delivers the stream is 5 inches in width by ¾ inch



B, the mouth of the blower. c, the cylinder. v v, the vanes.

in depth. Two light moveable vanes, *v v*, are placed one on each side of the cylinder, so that the pivots on which they turn are equi-distant from the orifice of the blower, and also from the plane passing through the axis of the cylinder by the middle of the current of air. Now, when the blower is put in action, the vanes of course place themselves in the direction of the current, as shown by the continuous lines; but when, in addition to the current of air produced by the blower, the cylinder is made to rotate with a certain velocity, the vane on that side of the cylinder, which moves in the same direction as the current, approaches the cylinder, while on the contrary side the vane recedes, as shown by the dotted lines.

It follows that on the former side there is a diminished, and on the latter an increased, pressure compared with that which existed when the cylinder was at rest. It must be here observed, however, that, to produce the most distinct effects, the velocity of the air produced by rotation must not be much less than that in the current from the blower. This result of the required proportion between the force of the two currents will be seen to have an important bearing on the fact mentioned in the beginning of this abstract, that the lateral deviation increases in a greater ratio than the distance.

Professor Magnus was assisted to an explanation of these results, by considering them as intimately connected with phenomena he had previously described and explained in a memoir "On the Motion of Fluids."* The experiments detailed in that memoir led him to enunciate the following proposition: "That when a fluid issues with a certain velocity through an orifice into a similar fluid mass, the pressure which exists perpendicular to the direction in which the mass moves is less than that which would be presented in the same place in a condition of rest." With regard to air and elastic fluids, it may be readily shown that this diminution of pressure does take place perpendicular to the direction of the current, by blowing air through a tube, and bringing the flame of a candle near to the stream of air; when this is sufficiently strong, the flame is seen to set itself nearly at right angles to the current; or if a light paper cylinder be suspended so as to be free to move, and a current of air be thrown obliquely against its surface, the cylinder will move towards the current. These and such like results may be explained on a principle nearly related to that already mentioned, viz. that when a stream of air or other elastic fluid issues from an orifice, or passes a contraction of any kind, and enters a mass of a similar fluid at rest, the moving mass by its momentum displaces the particles of fluid at rest, and expands itself, so that its tranverse sections have a greater area the greater the distance from the orifice; at the same time, in order to fill the partial vacuum caused by such expansion, a fresh portion of air enters laterally into the stream, or in any other direction but that opposed to the current.

This action may be shown by means of a hollow cone of tin having an opening at its apex, and one at its side: if air be blown through the hole at the apex, and a candle be held to that at the side, the flame will be seen to be drawn into the

* A translation of this memoir appeared in the Phil. Mag. vol. i. p. 5. 4th series.

cone. The remarkable effects observed in the year 1827 by Clement Desormes, viz., that when air or steam passes violently through an orifice in a flat surface which is covered by a flat disc much larger than the orifice, the disc, in place of being driven away, is apparently attracted to the surface, was stated to be referable to the same principle.

To return to the experiment with the rotating cylinder. On the side where the direction of rotation and of the current of air is the same, there is a tendency to increase the velocity of the moving air, and there is a diminution of pressure. On the other side of the cylinder, however, where the direction of rotation is opposed to the current, experiment showed that an increase of pressure occurred.

In some researches published twenty years ago by M. Felix Savart,* that philosopher showed that when two jets of liquid issuing from circular orifices of the same diameter, and having the same velocity, meet each other, so that the axes are in the same right line, the motion is not thereby annihilated, but the liquid moved laterally, so as to form a circular disc perpendicular to the direction of the jets.

An example, showing that the same kind of effect is produced by gaseous bodies, is afforded by the common fish-tail gas-burner. In this burner the gas issues through two perforations inclined towards each other, and, when ignited, exhibits a flame of a fish-tail form, whose plane is at right angles to that which passes through the two perforations. So in the experiment with the cylinder, where the air moved by rotation is opposed to that of the approaching current, a lateral motion takes place, repelling the vane on that side; and this repulsion attains its maximum when the velocities of the two masses of air have attained a certain ratio to each other (an equality nearly), and then its direction is perpendicular to that of the currents. This is what is indicated by the vane.

The application of these experiments to the theory of the deviation of projectiles is evident. Suppose that a spherical ball during its progressive motion rotates on a vertical axis, so that its anterior portion turns from left to right in reference to an observer behind the gun, then it follows, from what has preceded, that a diminished atmospheric pressure will obtain on its right side, and an increased pressure on the left, and, consequently, such a ball will deviate to the right. Again; if the axis on which the ball rotates is perpendicular to the plane of its path, then no cause for lateral deviation exists, but the pressures on the upper and lower hemispheres will be different. If the anterior portion of the ball turns from above downwards, the air put in motion by the rotation meets the resistance of the air through which it travels above, and there will be an increased pressure above the ball and a diminished one below. The range will therefore be diminished. The contrary will be the case if the front of the ball rotates from below upwards. The range will then be increased. In one position only, viz. when the axis of rotation is tangential to the path of the projectile, will there be no deviation, owing to the causes described. In every other position of the axis of rotation, either a lateral or a longitudinal deviation, or a combination of both, must ensue.

Thus, then, according to Magnus, an explanation of the deviation of pro-

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* Annales de Chimie et de Physique, vols. liii. liv. lv. 2nde series.

jectiles has been sufficiently established. But, in order to free it from every objection, it has still to be proved that the difference of atmospheric pressures against the opposite hemispheres is sufficient to produce a deviation in the projectile itself. For this purpose he devised the following experiment:—A light beam of wood, about 4 feet in length, is suspended from its centre by a thin wire, so as to form a sort of torsion balance; from one end of this beam a brass rod descends carrying a brass ring, within which a light brass cylinder, much like that already described, turns very freely on an axis, in the same manner as a common terrestrial globe turns within its brazen meridian. At the other end of the beam a counterpoise is adjusted. The blower before cited is placed below the beam so that it may be made to turn horizontally about a point nearly coincident with the prolongation of the suspending wire, while the mouth is about 2 inches from the cylinder. The plane of the ring being made perpendicular to the direction of the blast, the cylinder is now made to rotate rapidly from right to left, or *vice versâ*, by means of a thread wound round its axis, in the same manner as a humming-top is spun. While this is in a state of rotation the blower is put into action. The beam then with the cylinder revolves, and may be made to describe a large portion of a circle, the direction of its orbit depending on the direction which is given to the rotation of the cylinder on its axis.

In conclusion, the lecturer remarked, that it appeared to him that Professor Magnus had been successful in his researches, and that henceforward the phenomena of the deviation of spherical projectiles might be placed with a large category of facts which were capable of explanation by known and admitted principles of natural philosophy.

THE

Journal

OF THE

United Service Institution.

Vol. II. 1859. Appendix.

PROCEEDINGS OF THE TWENTY-EIGHTH ANNIVERSARY MEETING.

A General Meeting of the Members of the United Service Institution was held in the Lecture Theatre of the Institution, Whitehall Yard, at One o'clock, p.m. on Saturday the 5th of March, being the Twenty-eighth Anniversary Meeting.

The Right Hon. Sir John Pakington, M.P. First Lord of the Admiralty, and Vice Patron of the Institution, in the Chair.

I. The Proceedings of the last Anniversary Meeting were read.

II. The Annual Report of the Council was read as follows:—

1. In the Report of last year, the Council drew the attention of the Members to the arrangements which had been recently carried out for further developing the design of the United Service Institution, both by promoting the extension of Naval and Military Science and Literature, and also by the re-organisation of the Museum, for the purpose of rendering it more professional and practical in its character. They at the same time expressed their conviction, that, if they could succeed in obtaining the good will and co-operation of the Officers of the Naval and Military professions, the Institution would soon assume a prominent position as a scientific establishment.

2. In presenting to the Meeting the Twenty-eighth Annual Report, the Council have much reason to feel gratified with the progress which the Institution has made in the estimation of the Officers of the Naval and Military services during the past year. The number who have become Members is not only greater than usual, but there is this important differ-

GENERAL ABSTRACT OF THE ACCOUNTS OF THE UNITED SERVICE INSTITUTION

FROM 1st JANUARY TO 31st DECEMBER, 1858.

EXPENDITURE.

	Amount. £	s.	d.
Secretary's Salary	150	0	0
Clerk's do.	72	0	0
Servants' Wages	318	18	9
Do. Clothing	39	2	3
Lighting	56	11	4
Fuel	38	15	0
Postage	39	19	0
Insurance	29	5	0
Advertisements	28	11	0
Journals, Maps, Plates, &c.	681	3	8
Artificers, Carpenters, Ironmongers, Painters, Glaziers, &c.	691	6	7
Library	31	15	7
Stationery, Circulars, &c.	107	4	2
Assessed Taxes	84	1	8
Poor Rates, &c.	100	12	6
Income Tax for Clerk and Porter	3	19	6
Ground Rent	200	7	4
Legal Expenses	7	4	6
Lecture do.	14	3	0
Domestic sundries	15	18	9
Fixtures in late Secretary's quarters	13	10	0
Receipt Stamps	1	4	10
Miscellaneous	40	6	9
Total Expenditure	£2,766	1	2
Cash repaid to Agents, as per Vouchers	3	10	0
Balance in hand 31st December, 1858	48	11	2
Total	£2,818	2	4

RECEIPTS.

	£	s.	d.	Amount. £	s.	d.
Annual Subscriptions at 10s. for 1858	1,143	16	6			
Do. do. above	128	16	6			
Do. do. arrears	36	0	0			
Do. do. advance	10	0	0			
				1,318	13	0
Entrance Fees				221	0	0
Donations				121	12	0
Grant from Government				400	0	0
Life Subscriptions				105	10	0
Dividends				30	7	5
Sale of Waste Paper				10	12	6
£600 Stock sold at 98¼				588	12	6
Total Income for 1858				£2,796	7	5
Balance of Life Subscriptions in hand 1st January, 1858	3	2	9			
Balance at Bankers do. do.	18	12	2			
				21	14	11
Total				£2,818	2	4

Heads under which extraordinary Expenditure took place:—

	Ordinary. £	s.	d.	Extraordinary. £	s.	d.	Total. £	s.	d.
Servants' Wages	301	6	9	17	12	0	318	18	9
Artificers	144	3	2	547	3	5	691	6	7
Printing and Stationery	98	13	5	8	10	9	107	4	2
Miscellaneous	17	13	11	22	12	10	40	6	9
Total	—		—	595	19	0	—		—

17th February, 1859.

Examined and found correct,

J. M. CASE.
J. E. A. DOLBY.
HENRY ELLIOT.
THO. SMITH.
} Auditors.

ence—that whereas, in recent years, it required considerable exertion to maintain the number of subscribers, during the last year, on the contrary, a warm and cordial feeling towards the Institution has been exhibited, and a spontaneous disposition to join it has been displayed.

3. While, therefore, the COUNCIL are striving to increase the advantages which the Institution presents, and trust, by making it worthy of the Profession of Arms, to command the support of Officers, yet they do not for a moment withhold their opinion, that the finances upon which they can at present rely are not adequate to enlarge its efficiency, or even to maintain the system which they have recently adopted. For a permanent increase in the revenue, they must chiefly rely on the Full Pay of the Services; and unless they can succeed in obtaining the cordial sympathy and assistance of Officers of high rank and influence, they may not secure that vigorous support, which alone can enable them to develope to the fullest extent the objects which the Institution is designed to promote.

4. With a view of making the Institution known to young Officers on joining the Services, the COUNCIL propose to transmit the Report of the year to each Officer when he is gazetted, in the hope that his admission to the Institution may be considered by his family and himself in the same light as many other subscriptions which are usually paid on appointment.

THE MEMBERS.

5. During the year ending 31st December, 1858, 221 Members have joined the Institution; the deaths and withdrawals amount to 95. The names of 48 Members, whose subscriptions have been from two to four years in arrears, and who have not replied to the repeated applications which have been addressed to them, have been removed from the list. The increase upon the year is, therefore, 78. A Detailed Statement of the changes among the Members, and the Tabular Analysis, appear in page xix.

FINANCE.

6. The COUNCIL now submit the General Abstract of the Accounts for the year 1858, as audited on the 17th of February, 1859 (*see* opposite page).

Receipts.

The ordinary receipts have exceeded the estimate by £140. In addition to this, the income of the year has been augmented by most liberal donations; and the COUNCIL remark with satisfaction the gradual increase in the number of Members who have raised their annual subscriptions from ten shillings to one pound; viz., from 106 in 1857 to 128 in 1858. This branch of the Financial System is one of such vital importance to the stability and efficiency of the Institution, that the COUNCIL will again return to the subject in commenting upon the merits and advantages of the Journal.

Expenditure.

7. The expenditure of the year divides itself into two distinct heads; viz., ordinary and extraordinary.

In addition to the absolute necessity which existed, of painting and cleaning the interior of the premises, the year 1858 has been essentially one of alteration, re-organization, and improvement. In the last Report, the COUNCIL detailed at some length the plans they recommended, and submitted them for the approbation of the Members; they announced that a sum of about £500 would be required to defray the expenses of renovation, and to carry out the proposed improvements; and they expressed their opinion that "*it would be better to expend the large amount above-mentioned than to lose the opportunity which now presents itself of raising the character of the Institution, both in its position as a Museum and as a means of promoting the progress of professional information.*"

8. The amount then estimated has been exceeded by nearly £100. Many of the improvements were not originally contemplated, but became absolutely necessary as the re-arrangement of the departments advanced; but they are so calculated to exalt the Institution in public and professional estimation, that the COUNCIL trust the Meeting will approve of the course they have pursued.

Ordinary.

9. The ordinary expenditure of the past year, *excluding* the expenses attached to the Journal, exceeds the estimate laid before the last Annual Meeting by about £60. The principal increase is in the following items: fuel and light £30, of which £18 are unpaid bills of 1857; printing £48, chiefly caused by a considerable increase of business; artificers £44. A further sum of £13 for fixtures in the Secretary's quarters has been paid to Mrs. Tonna; and £7 for legal expenses incurred on the renewal of the trust-deed six years ago. On the other hand there has been a decrease of £36 in rates and taxes, and £15 for lectures. A bill of £35 for printing a catalogue of the museum in 1849, adverted to in the last Report, is still unpaid.

10. The heaviest charge against the Institution in the ordinary expenditure is the Journal, viz., £681; in this sum, five numbers (one of which was published in 1857), and the Report of last year, are included. The Parliamentary grant of £400 has been applied in liquidation of the expenditure caused by the developement of the scientific departments of the Institution.

Extraordinary.

11. The extraordinary expenditure must also be divided into two heads, viz. the expense incurred in cleaning the building, which was partly rendered necessary by the operations of the Commissioners of Sewers, and that relating to the re-organisation of the Museum. As regards the former, the amount expended has been £274 14*s.*; and, when the number and size

of the rooms, and also the very large quantity of wood-work therein, are considered, this sum does not appear to be greater than might have been expected.

12. Under the head of improvements, £321 5*s*. have been spent; in this sum the alterations in the arrangement of the Museum, and the additional cases and shelves, rendered necessary by a more methodical classification, are included. The expense which has been incurred under this head will be more clearly understood when the COUNCIL report the progress which has been made in the Museum during the past year.

13. In order to defray the extraordinary expenditure adverted to, the COUNCIL directed £600 stock to be sold. The funded property of the Institution at the present time is reduced to £438 Three per cent. Consols. Though the COUNCIL are firmly convinced that it would be of the first and highest importance to make any sacrifice to render the departments of the Institution as perfect and useful as possible, yet they fully believe that they are now in such a state of order, that it will be in their power to make all the requisite improvements and maintain a steady progress, without having again to resort to extraordinary means.

14. The following is the estimate of the ordinary receipts and expenditure for the year 1859:—

ESTIMATE OF PROBABLE RECEIPTS AND EXPENDITURE FOR 1859.

EXPENDITURE.	AMOUNT. £	*s.*	*d.*	RECEIPTS.	AMOUNT. £	*s.*	*d.*
Secretary's Salary	150	0	0	Annual Subscriptions	1344	0	0
Clerk's Salary	72	0	0	Entrance Fees	200	0	0
Servants' Wages	300	0	0	Dividends	12	0	0
Ditto Clothing	36	0	0				
Fuel	38	0	0		1556	0	0
Lighting	22	0	0	Parliamentary Grant	400	0	0
Domestic Sundries	20	0	0				
Postage	40	0	0		1956	0	0
Assessed Taxes	86	0	0				
Income Tax for Clerk and Porter	4	0	0				
Rates	100	0	0				
Ground Rent	201	0	0				
Printing and Stationery	50	0	0				
Fire Insurance	29	0	0				
Advertisements	40	0	0				
Library	70	0	0				
Artificers, Repairs, Casualties, &c.	140	0	0				
Lectures	20	0	0				
Bill for printing Museum Catalogue in 1849	35	0	0				
Journals	500	0	0				
Balance	3	0	0				
Total	£1956	0	0	Total	£1956	0	0

The Journal.

15. The Council have much satisfaction in recording the increasing estimation in which this publication is held, and the high character it has already obtained. They have spared neither expense nor labour in bringing it out, in a style worthy of the gentlemen who have favoured them with scientific information, and in a manner creditable to the Institution. The anticipations of the success of the Journal which they ventured to express are being gradually realised, and many Members have been induced to join the Institution in consequence of its publication.

16. In the last Report the Council announced that they proposed *for the present* to issue the Journal to the Members free of all charge, and to forward it to them free of expense; and they further stated in the "Notices to Members" which have appeared in each number, "*that Members are entitled to receive the Journal free of charge, so long as the funds admit of it.*"

17. This intention they have hitherto systematically carried out, and no less than eight Numbers have been thus issued in two years. The Council, however, feel it their duty to acquaint the Members that, at the present rate of Annual Subscription, it is totally out of their power to continue this system with due regard to the efficiency of other departments, and at the same time to maintain the Journal at its present high standard. The expense attending its issue is not only for printing, sewing, banding, &c.; but it embraces lithographing, woodcuts, short-hand-writers, transcribing, copies for lecturers, and postage. It is, therefore, evident that either a very large increase of Annual Subscribers at 10*s.* is absolutely necessary, or of Members who are willing to increase their Subscriptions to £1.

18. The Council have been impressed with the importance of showing to the naval and military services the manner in which they wish to carry on the business of the Institution, but they feel that they have endeavoured to give the Members more than they could reasonably expect for the present Subscription; they do not, however, propose to make any alteration during the present year, but to continue to issue the numbers of the third volume to the existing Members, and those who join before 1860; but they take this opportunity of laying before the Meeting the opinions they entertain upon this subject, and the remedy they venture to suggest.

19. It is, therefore, necessary to decide upon what terms the Journal shall be hereafter issued, and this question brings on a re-consideration of

The Life and Annual Subscriptions.

20. In the Report of last year the Council stated, that, though they had been frequently urged to propose an increase of the Annual Subscription, they had hitherto declined to do so, as they were anxious to obtain the co-operation of a large portion of officers upon full pay, and that it

could hardly be expected that those who were serving abroad would be willing to pay an increased Subscription during their absence.

21. The COUNCIL, however, have endeavoured to ascertain what prospect exists of obtaining so large an increase of numbers as would permanently augment the revenue of the Institution. They find that the casualties have frequently equalled the number who have become Members during the year, and that there are numerous instances of Members who cease to pay their Subscriptions, and whose names are eventually removed from the List.

22. Such being the case, and under the circumstances in which the naval and military forces are serving, the COUNCIL consider that there does not appear a fair expectation of such an augmentation in the number of Subscribers as would raise the resources of the Institution to the extent necessary for the effectual advancement of its interests. They therefore submit a plan for the consideration of the Members, which, while it deprives no one of the privileges he was entitled to previous to the publication of the Journal, yet gives him the opportunity of establishing his claim to receive it.

23. The COUNCIL suggest that all Members who are Subscribers of £1 a-year shall, after the 1st of January, 1860, be entitled to receive the numbers of the Journal that are issued after that date, but that those who pay only 10*s.* a-year, shall receive, as heretofore, the Annual Report, but not the Journal, unless they are serving abroad.

24. That Life Subscribers who wish to receive the Journal shall, after the 1st January, 1860, pay a further composition of £3, or an Annual Subscription of 10*s.*; but that Life Members who have given donations to the amount of £10, including their Life Subscription, shall be entitled to receive the Journal.

25. Should these proposals meet the approbation of the Members of the Institution, they necessarily involve an alteration of

THE LAWS.

And the COUNCIL propose to avail themselves of this opportunity to bring under the consideration of the Members the general state of the Laws, with a view to their revision at an early period.

26. The first section by no means sufficiently or accurately describes the object which the Institution is designed to promote. Its action has of late years been so widely extended, that the wording of the first Law is feeble in description, and undecided in expression. The Museum or Repository, though a most valuable accessory, is made primary and prominent, while the intellectual and scientific development of the Institution is treated as secondary.

27. There are also many portions of the Laws which have become obsolete, and which are in practice neglected, while others require alteration to render them more intelligible and distinct.

28. Connected with a revision of the Laws is the question of

NATURAL HISTORY.

The COUNCIL conceive it to be their duty to report to the Meeting, that in their opinion the time has arrived for the Members seriously to consider whether Natural History can be retained as a Department with advantage to the professional objects of the Institution.

29. At the commencement of last year it was decided that that part of the collection which related to quadrupeds and birds, &c., should be reduced, and that the system of keeping types of species should be adopted. But even if this system was carried out effectually, much greater space would be required for their exhibition than that which they now occupy; and the Institution can neither afford the space nor the expense that would be requisite to bring the collection into a condition that would be sufficiently useful and instructive.

30. The advantage of keeping such a collection in this Institution, if complete, is this: it affords the Members whose duties call them to all parts of the world, the means of examining and becoming acquainted with the types of various classes of animals, by which a taste for that study may be promoted, and recreation afforded at distant stations.

31. It is however observed in practice, that the rooms which contain the Specimens of Natural History are chiefly inspected by the ordinary visitors as objects of curiosity, and that few of the Members make use of them.

32. On the other hand, the professional departments of the Institution are undergoing considerable extension, and the COUNCIL are endeavouring to provide models, plans, &c., illustrative of the Art of War. One of the best rooms in the building is devoted to Natural History, and the COUNCIL already feel that more space is required for the exhibition of *professional* objects.

33. The COUNCIL, therefore, recommend that the questions relating to the Collection of Natural History and to the revision of the Laws be brought under the consideration of a Special General Meeting during the course of the ensuing season.

THE SEVASTOPOL MODEL.

34. The COUNCIL have the pleasure of announcing that the New Model of the Siege of Sevastopol and the South of the Crimea, constructed by Colonel Hamilton, C.B., Grenadier Guards, was deposited in the Institution last June.

35. The Council are of opinion that the thanks of the Members are due to Colonel Hamilton for the great ability and the unwearied exertion he has shown in the construction of this most interesting Model, which is a most valuable and useful acquisition to the collection.

Her Majesty's Visit.

36. On the 21st of June Her Majesty, accompanied by the Prince Consort, the Duke and Duchess of Brabant, and Count of Flanders, was graciously pleased to honour the Institution with a visit, and minutely examined the various details of the Model. Her Majesty expressed herself extremely interested by the elaborate manner in which each of the well-known features of the theatre of that great struggle was pourtrayed. Her Majesty afterwards inspected the other departments of the Institution.

37. His Royal Highness the Prince Consort, to whom the Members are indebted for the commencement of the Model, expressed his high appreciation of the skill exhibited in its construction. His Royal Highness the Commander-in-Chief, accompanied by their Royal Highnesses the Duchess of Cambridge, the Grand Duchess of Mecklenburg Strelitz, and the Princess Mary of Cambridge, also visited the Institution and inspected the Model on the 19th of June.

Vice-Patron.

38. The Council have the pleasure of announcing that His Royal Highness the Prince of Wales has consented to become a Vice-Patron of the Institution.

Vice-President.

39. The Council regret to have to record the loss the Institution has sustained in the death of Lieut. Henry Raper, R.N., one of the Vice-Presidents. Lieut. Raper had been a Member of the Institution from its foundation, and for upwards of twenty years took an active part in conducting its affairs. He was noted for his professional and scientific attainments, and was for many years Secretary to the Royal Astronomical Society; he was the author of many valuable works, including "The Practice of Navigation and Nautical Astronomy," which passed through six editions, and obtained for him the gold medal of the Geographical Society. The Council have elected to the office of Vice-President, Major White, who has for several years conducted the Finance of the Institution.

Honorary Members.

40. For a considerable period the Laws which regulate the admission of foreigners of distinction, and the Corps Diplomatique, to the Institution as Honorary Members, have been allowed to fall into disuse. The Council, however, have the pleasure of announcing that His Royal Highness the Count de Paris, who has frequently visited and taken much interest in the establishment, has become an Honorary Member. The Council have

also invited the Foreign Ambassadors to become Honorary Members, and they have the satisfaction of stating that the representatives of the Governments of America, Austria, Bavaria, Belgium, Brazils, Denmark, the Netherlands, Portugal, Prussia, Russia, Sardinia, and Sweden, have availed themselves of this privilege. The Count de Platen, the Minister of His Majesty the King of Sweden, having served in the British Navy, became a Member of the Institution last year.

The Admiralty and War Department.

41. The Council take this opportunity of expressing their obligations to the Board of Admiralty, and to the Secretary of State for War, for the willing and cordial manner in which they have received their numerous applications, and for the contributions and assistance they have rendered; and they also desire to record their acknowledgments to the officers in charge of departments for the readiness with which they have forwarded their wishes. At the same time the Council venture to express the hope that these two Departments of the State will extend to the Institution a still more general patronage, calculated to give it a greater importance in the estimation of the Officers of the two Services.

The Museum.

42. The re-arrangement of the Museum, which was in progress at the last Annual Meeting, has been completed; and the Council will now give a brief summary of the works which have been carried out, and the additions which have been made to the Museum.

43. In the course of last summer the Council requested the Foreign European Governments to favour the Institution with specimens of the clothing, arms, and field equipment of a soldier of the line and rifleman, believing that they would be interesting and useful to the Members. They have the satisfaction of stating that their requests were most courteously responded to; and the Governments of Austria, Prussia, and Sardinia have already complied with their application.

44. A room has been added to the armoury, containing specimens to illustrate the progressive manufacture of every part of the Enfield rifle from the raw material to its completion and final adjustment. The Council must express their great obligations to Her Majesty's Government, and to Lieut.-Colonel Dixon, the Superintendent of the Royal Factories at Enfield, for the assistance which they have rendered. In the same room have been deposited a variety of breech-loading arms, and different descriptions of locks.

45. In the Military Model rooms, a great number of models and specimens of military *matériel*, and a series of implements used in mining operations, &c. &c., have been added, with a view of affording such information as might be generally useful to Officers not belonging to the Ordnance corps.

46. During the year the whole of the Naval Models have been repaired; the Admiralty Charts have been arranged, and completed with the most recent surveys; the Natural History department, in its several subdivisions, has been classed; and throughout the Institution, the articles exhibited have been re-labelled and described so as to afford information to the visitor. These various additions and changes have caused considerable expense, both by the employment of proper persons to carry them out, and also in the preparation of cases and stands for exhibiting them to the best effect. The work has been very extensive, and the labours of the Special Committee have been unremitting.

The Trafalgar Model.

47. The Council have the pleasure to report, that a Model of the Battle of Trafalgar is now in construction, the expense of which will be defrayed by private subscription, as was the Model of the Siege of Sevastopol; and that the Committee appointed by the Council to superintend the progress of the Model expect that it will be ready for presentation to the Institution by the end of the year.

Topographical and Hydrographical Department.

48. A Topographical and Hydrographical department has been commenced under the superintendence of Lieut.-Colonel Alcock and Captain Nolloth, and though, in consequence of its being necessary to re-arrange entirely the numerous Charts and Maps, it is not yet complete, the Council trust that it will attain an effective condition during the present year.

49. The Council propose to mark on Maps the Stations of all the British Forces, Naval and Military, according to the latest information; and, in case of operations in the field, to show the various changes of position and movements of the belligerents.

50. The Council are most anxious to obtain surveys, plans, and reports from Officers serving abroad, or travelling in Foreign Countries. Officers of the Army are now required to give satisfactory proof of their ability and professional knowledge previous to promotion and appointment to the staff. The Council will gladly receive any surveys, &c., which Officers may be willing to transmit, and reports or descriptions will, at their discretion, be read at Evening Meetings.

Presents.

51. A List of the Presents and Additions to the Library and Museum, received since the last Evening Meeting, is appended, page xxv. The Council, however, think it their duty specially to notice a class of presents which have recently arrived.

52. During last summer they addressed the representatives of the British Government at the Foreign European Courts to the effect, that, in their

opinion, Military Science would be advanced by an interchange of communications and of professional papers, and, in earnest of their wishes, transmitted the first volume of the Journal of the Institution, requesting them to present it to the several Ministers for War.

53. The COUNCIL have much pleasure in announcing that their views have been most cordially responded to by several Governments, who have presented to the Library works which form a most valuable acquisition, viz.—

BELGIUM . . .	Plans of the Camp at Beverloo, 20 Plates.
DENMARK . . .	3 Volumes of a Military Journal.
	2 ditto of a Naval Journal.
NETHERLANDS . .	21 Maps prepared in the Topographical branch of the War department at the Hague.
PRUSSIA . . .	22 Volumes of Archives of the Artillery and Engineers.
RUSSIA	3 Numbers of a Military Journal published by the Division of the General Staff and Committee of Military Instruction.
SARDINIA . . .	7 Volumes of a Military Journal.
SWITZERLAND, BERNE .	2 Volumes of Military Review.

54. It is a great satisfaction to the COUNCIL to observe that the necessity of a Metropolitan and National Institution, devoted to Naval and Military Science, is now distinctly recognised by the Officers of both services and by Her Majesty's Government; and that the advantage of a central repository, containing a large professional library, and objects of general professional information and interest, is fully acknowledged.

55. The sciences connected with the warlike professions have not, until recently, possessed any Institution devoted to their exposition and promulgation, and the United Service Institution aspires to become to them what other establishments are with regard to the sciences they respectively represent. The COUNCIL earnestly request the individual co-operation of Members in securing such an amount of public and professional support, as may enable them to effect this important object, and, by extending the efficiency of the Institution, to perform their duty to the professions and the country.

III. General Sir JOHN BURGOYNE, G.C.B., Royal Engineers, said,—

Mr. Chairman, in moving "That the Report now read be adopted and printed, for circulation amongst the Members," it is not necessary for me to go into any particulars, because the Report is very complete, and, with regard to a great many very important points, highly satisfactory. This is an Institution such as the British Army and Navy ought to possess in the metropolis of this country, and if it meets with the support which we cannot doubt it will meet with, it will rise to the eminence of which it is worthy, and be of the greatest service to the Military and Naval bodies. We are, I think, very much indebted for the excellence to which it has arrived at present to the exertions of the different COUNCILS that have been established, particularly the last. Considering the small means at their disposal, I think the degree of perfection to which the COUNCIL have brought this Institution is really astonishing. There is one point which has been adverted to in the Report, which requires particular observation, namely, that you may divide this great Institution into two branches—one I should call the stationary branch, the Museum and the Library; and the other the working

branch, that is, the Lectures, and the part that more immediately leads to the officers improving themselves by study and by discussions. Now, it appears by the Report, I am sorry to say, that this latter part requires still further development, and we want the means; for, after all, nothing is wanting but the pecuniary means to set it going; and I do hope that the COUNCIL will meet with that encouragement which the Institution so much requires for that most important branch.

Captain Sir FREDERICK NICOLSON, Bart., R.N.—

Mr. Chairman, I have much pleasure in rising to second the Motion which has been made by the gallant officer. I think it will be a source of great gratification to all the Members of the Institution to know from the Report that there will be no further resort to extraordinary means. I think, by the exertions of the COUNCIL and other Members, the Institution has now been brought to a degree of perfection which certainly, when I left England, I never expected it would attain. It has been my fate to be away from England for a great many years, and I am certainly astonished at what has been done during my absence; and, if it can be so arranged that extraordinary means are not to be resorted to, it will be of the greatest possible advantage to the Institution, because then I think we shall be able to expend more upon Lectures, for which I see the estimate is only £20. I think that good lectures delivered here—not merely by Members of the two professions, but likewise by professional lecturers—are very likely to attract a number of members who take an interest in scientific subjects. I notice with great pleasure that there is a proposal to make some change with regard to the annual subscription. I believe this will be referred to at the Special General Meeting, therefore I shall say nothing more upon the subject. I have the greatest pleasure in seconding the Motion for adopting this very able and interesting Report.

Lieutenant GARDINER, R.N.—

Mr. Chairman, before you put the Motion, perhaps I may be permitted to ask one or two questions. In the thirty-third paragraph of the last Report, there is a statement that the COUNCIL were in anticipation of receiving £750 from the Board of Works, for dilapidations caused to this building. I wish to know whether that money has been received, because, if it has, there must be a surplus left over after the expenditure of the £500 which have been laid out for the repairs here. We see no statement of that money in the balance sheet if it has been received. Again, upon looking at the balance sheet, I am sorry to see that last year we had £1,000 odd pounds of stock, and this year we have reduced it to £400, and when I recollect than in 1843 we had £6,700 of stock, it is rather strange that we should go on first investing and then selling out and expending. The receipts have not, *bonâ fide*, paid the expenditure, because if you have sold out £300 of stock, and have only a balance of £3, you have expended £297 more than your annual receipts. There is one other point I wish to mention: when we talk of altering the laws (which has been mooted in this room before), I would venture to suggest whether it would not be more advisable at once to get a charter for the incorporation of this Institution. Would it not give a greater degree of stability and respectability? I think it is worthy of the attention of the COUNCIL, when they are revising the laws, that they should see if they cannot get the Institution incorporated. I think some gentlemen have objected to it, but in my opinion, if it had been incorporated, at this time a great portion of the £6,700 which have been expended would not have been lost. I have taken a little interest in this Institution, and have attended its yearly meetings, and I admit that there is a great increase. When I saw that last year we had £1,000 odd of stock, I was in hopes that we were going to accumulate, instead of which we have diminished. I hope I shall have an answer with respect to the £750 to which I adverted.

Colonel LINDSAY—

With regard to the first question to which the gallant officer has adverted, the meeting will perceive that, in paragraph thirty-three of the Report of last year, it is particularly stated that the COUNCIL declined to accept the £750.

Lieutenant GARDINER.—As being insufficient.

Colonel LINDSAY.—

Not as being insufficient; but to throw upon the Metropolitan Board the responsibility of doing their own work. We knew perfectly well, from information that we received from our own officers, that £750 never would cover it, and therefore we declined to receive a single sixpence from them; we said, "You, yourselves, did the damage, therefore you yourselves be good enough to repair the damage which you have done." With respect to the sale of Stock, we have stated the circumstances which rendered it necessary, in order that the Members of the Institution may see exactly the state of affairs. We stated in our last Report the reason for incurring an extraordinary expenditure, and why it was necessary—and it received the approbation of the Members. We had £1,000 in the Funds, undoubtedly; but we had been for some years, if not in a declining state, at least in such a state of prostration from the poverty of our finances, that we were unable to advance the interests of the Institution; and we saw that the moment the Government agreed to place a sum in the Army Estimates for this Institution, there was an opportunity of raising its character. The whole Institution required to be re-organized for the purpose of putting it into an advanced position, and I believe that has been done to the satisfaction of the Members generally. As Stewards of the public, for we hold these buildings from the Crown, it was necessary for us to keep the Institution in repair. It would have been wrong in principle if we had allowed a great number of years to have passed by without painting the whole of the building. Any gentleman who has experience of the expense of putting a building in complete repair after a certain number of years, will understand that from the size of the building and the immense quantity of wood-work within it, this could not be done for less than from £200 to £300, and we spent between £200 and £300 more in increasing the collection of professional objects, and in re-organizing the Museum in a manner worthy of its objects. The sum of £500 was sanctioned by the last Meeting for this purpose; we have exceeded that sum, as we state, by £100, therefore I point out to the Members that instead of the £500 of Stock which we were authorized to draw, we have drawn £600, because we found in the course of the Improvements we could not stand still, but we were obliged to advance and make greater Improvements than we originally contemplated. Before I sit down, there are one or two subjects to which I think it my duty, as the Chairman of the COUNCIL for the past year, to advert. I will do so very shortly, because they will prove, better than any other explanation, the progress which this Institution has made. The first subject is the Journal. Enough has been said as to the estimation in which the Journal is held in the Report, therefore I will not say anything with regard to its character. But there is one important effect produced by the Journal; we send out the Journal to all parts of the globe, we transmit it to the Officers of the Army and Navy who are Members, and who are serving at distant Stations; and the effect of our sending it to them has been that Officers who do not belong to the Institution send to us to request to become Members. No less than three or four Officers last week sent their subscription papers from the Cape of Good Hope, in consequence of the estimation in which they hold the Journal. With regard to Lectures, we have never have lost sight of that great object of attaching somebody to us of a professional character, or of paying for Professional Lectures, and we hope soon to be able to arrive at that point. Hitherto, undoubtedly, we have been obliged solely to rely on Officers of the Army and Navy to assist us in giving Lectures, and to whom the Council and the Service have been deeply indebted—and we hope still to continue to be supported by them. It will however be a great improvement if we are able to obtain the services of gentlemen whose time and experience are devoted to scientific subjects which may be applied to the advancement of professional science. We have recently received Lectures from two Officers in the service of Government, whose time is much occupied in their respective departments, viz.:—Colonel James, at the head of the Topographical Department, and Admiral Fitzroy, at the head of the Meteorological Department, attached to the Admiralty. With regard to a Charter, it has been mooted two or three times in this Institution before, and I believe the opinion of the COUNCIL was most decidedly in its favour; but it will cost a considerable sum. You certainly cannot get a charter under £300.

Lieut. GARDINER.—I do not think it will cost anything like that.

Colonel LINDSAY.—

All I can say is, that we will do our best to get it as cheap as we can, when the proper opportunity presents itself. I quite agree with the gallant officer that it would be a great improvement to have a Charter. There is one point more, with regard to the increased subscription. I am happy to observe that during the past year, and particularly during the two months of the present year, a very large number of Members have voluntarily come forward and offered to increase their subscriptions from 10s. to £1. This has been done without any pressure on the part of the COUNCIL; they say —"You have given us a good thing, we are quite sure you cannot continue it at the present small subscription, and we shall be most happy to raise our subscriptions to £1." According to the general expression of feeling which we have heard from most of the Members who have come to the Institution, we have put into the Report this year a suggestion from the COUNCIL that it should be open to the Members voluntarily to increase their subscriptions, and which shall enable them to receive the Journal, commencing with the beginning of next year. I give notice that the COUNCIL propose, upon the first Saturday in April, to summon a Special General Meeting for the purpose of taking these subjects into consideration. I have also to announce, before I sit down, that Colonel Hamilton, to whom the construction of the Sevastopol Model does so much credit, has prepared also a description of the model, with a map showing all the different features of that model, which will be of great assistance to visitors, and also to officers who were not in the Crimea, in studying the general features of the model. The pamphlet will be ready in the course of the present month. I am sure that there is very little now required but a general good feeling on the part of the Members of the Institution to carry it to its legitimate position, and to make it what we desire it to become, namely, a scientific Institution for the promotion of Art and Science relating to the Army and Navy.

The Resolution was put to the Meeting and carried unanimously.

IV. The names of Eight Members retiring from the COUNCIL were read:—

Captain PACKE.	Major-General EDWARDS.
Captain FISHBOURNE, R.N.	Rear-Admiral CODRINGTON.
Captain SWENY, R.N.	Major JERVOISE, R.E.
Captain JEFFERSON.	Colonel DUNNE.

V. Captain ROBE, R.N.—Mr. Chairman, I rise to propose this Resolution:—"That the Thanks of the Meeting be given to the Members of the COUNCIL who retire by rotation, and that the following officers be elected to fill the vacancies:—

Captain E. PACKE.	For Re-election.	Rear-Admiral GEORGE ELLIOT.
Captain E. G. FISHBOURNE, R.N.		Captain KEPPEL, Gren. Gds.
Captain JEFFERSON.		Captain Sir WILLIAM WISEMAN, Bart. R.N.
Captain Sir SIBBALD SCOTT, Bart.		
Lieut.-Colonel CONSTANTINE READ.		

Whoever looks round this Institution will see what ability, care, and trouble the COUNCIL have exerted in bringing it to its present state of perfection. The manner in which it has been conducted reflects as much credit upon the COUNCIL as is possible. The able manner in which the Lectures and Journal are conducted, and in fact the way in which the whole establishment is conducted, is to them as much honour as it is a

source of gratification to ourselves. When we recollect what this Institution was a few years ago, and when we see at the present time the progress that is constantly made, and when we know that the Journal is circulated in every part of the world, we must be of opinion that we owe a debt of gratitude to those who have the conduct of the Institution, and at the same time look forward to its development and improvement.

The Resolution having been seconded by Colonel PASCHAL, was put to the Meeting, and carried unanimously.

VI. Sir SIBBALD SCOTT, Bart.—Mr. Chairman, I beg to move, "That the thanks of the Meeting be given to the Auditors for their valuable services, and that the following gentlemen be elected for the ensuing year:—

JOHN CASE, Esq. Navy Agent.
Captain H. L. DE LA CHAUMETTE.
Captain J. E. C. DOLBY, late North York Rifles.
H. ELLIOT, Esq.
THOMAS SMITH, Esq. Army Agent.

The COUNCIL have to regret the loss by death of one of them, the late Joseph Charlier, Esq., and Captain De la Chaumette is proposed in his place, and he has expressed his willingness to serve in the office.

The Rev. Mr. GLEIG (Chaplain-General) seconded the Resolution, which was put to the Meeting and carried unanimously.

The CHAIRMAN announced that the business of the day was concluded.

General Sir GEORGE POLLOCK, G.C.B., of Her Majesty's Indian Forces, having been called to the Chair, said,—

Gentlemen, the proceedings of the day having closed, I have now much pleasure in proposing that a vote of thanks be offered to Sir John Pakington for his kindness in having taken the Chair. His avocations are very great, and it must be a sacrifice to him to devote two hours to a Meeting of this kind, and therefore I think we are deeply indebted to him.

Admiral Sir THOMAS HERBERT, K.C.B. seconded the Motion.

Sir JOHN PAKINGTON.—

Sir George Pollock, Sir Thomas Herbert, and Gentlemen, it is now my duty to acknowledge, which I beg to do in the most respectful and grateful terms, the compliment which you have been so good as to pay me. In acknowledging that compliment, gentlemen, I shall not presume to intrude upon your attention for many moments. One reason is that which has already been adverted to by the gallant gentleman in the chair, that moments are with me so precious that I am obliged to economize them as much as I can. But, gentlemen, there is a still more formidable impediment than the want of time to my addressing, even if I could presume to do so, any extended observations to you upon this occasion, and that is, although I have had the honour, during the period that I have held my present arduous office, of being, I may say, connected with this Institution, I regret, from the incessant pressure of duties in that office, that this is the first occasion on which I have entered this building, and the first occasion on which it has been in my power to take in any sense an active part in the proceedings of the Institution. I therefore do not feel that I am competent to dwell upon any of those subjects which have been adverted to to-day, more especially considering the fact, that the objects of this Institution have been treated by those who have the advantage of practical knowledge and long acquaintance with its affairs, and who are therefore really competent to address

to you observations with regard to your present position, and which would be scarcely proper on my part, from the fact that I cannot be personally acquainted with them. Gentlemen, I cannot help making this one observation, and here I am competent to speak, that upon coming amongst you to-day, I see around me, upon these benches, gentlemen who have been long known to me, who are known to the country, and, I may add, without exaggeration, known to fame as officers of the greatest possible distinction in both our noble services of the Army and the Navy. It is impossible for me to doubt, when an Institution of this kind receives the sanction of so many officers of such great distinction, without referring to the very numerous members of the society who are no doubt prevented by various causes from being present to-day,—when I see such an Institution so supported, I cannot hesitate, even if there were no other proof of it, in at once adopting the entire belief that it is a most beneficial Institution, and that an Institution so supported must be successful. Gentlemen, I see in the Report which has been read to you to-day by your Secretary that the design of this Institution is laid down in clear and simple language, that the object of it is for promoting the extension of naval and military science and literature. Those are objects which speak for themselves. No man of ordinary understanding, and with the most common acquaintance with our great services, can doubt that any Institution must deserve the support of those services which seeks the spread of naval and military science and literature. You are aware, gentlemen, that by position in life I am a civilian. My connection with one of those great and noble services is merely that of official connection as a public man. With the Army I have no connection, beyond that connection which every Englishman must feel, of gratitude to a most distinguished body of men, and a most noble service. With the Navy I have the great honour to be officially connected, and I yield to no man in my great admiration of that noble service; and let me add, that my official connection with that service has been enough to teach me, and there I have no hesitation in speaking with some feeling of confidence, that anything which tends to the spread of science and literature connected with the service must at all seasons be beneficial. But let me add, there never was a moment in the history of the Royal Navy when such advantages were more desirable than they are now. Never was there a moment when the cultivation of science in connection with the Navy was more important to the greatest interests of this country. Considering, as one illustration of this position, the extraordinary increase which has taken place in the size of our men-of-war, perhaps you will allow me to mention, as a remarkable instance of this fact, a statement which it was my duty to address to the House of Commons in speaking of the Navy a few evenings since. Only ten years ago, I think, as nearly as possible, speaking in round numbers, the construction of a 50-gun frigate cost £50,000. In the year 1855, the construction of a 50-gun frigate cost rather more than £70,000; and in the year 1858 the construction of a 50-gun frigate cost upwards of £90,000. Now these are striking and remarkable facts, and they serve to explain many points of which the public is naturally desirous of explanation. But when you find, with respect to the same class of ship, that is to say, a ship that passes by the same name—a ship that is still called a 50-gun frigate—the cost of the construction rising in this ratio in the short period of ten years, it becomes evident that a great and rapid change is taking place, and that the application of science, and science of the highest order, becomes more and more important with respect to that class of vessel. What is true with respect to a frigate, is of course true as to other descriptions of vessels. I only mention this as an illustration. Then we have to bear in mind the universal application of steam of late years, in a new mode and at a gigantic cost. Huge sums of public money are to be expended in those directions, and therefore of course the cultivation of science becomes all-important. At this moment we are about to embark in another wholly new description of construction. I allude to those floating cuirassiers. We are going to have vessels coated with iron—those vessels can only be constructed, or at least they can only be made beneficial to the public service when they are constructed, by the most careful application of the most scientific principles. I throw these observations out, gentlemen, merely to show that I am sure every man in England who has at heart the welfare of these services must value an institution which has for its object the promotion of science in connection with them. As I speak, it occurs to me that there is another important element of improvement common alike to the Army and the Navy, namely, the great

and rapid improvements which are now taking place in our Ordnance and Artillery; and let me here advert in terms of well-merited eulogium, not only to the great science, not only to the great skill, but, I must in truth and justice add, to the noble and patriotic spirit of Sir William Armstrong. Here again, gentlemen, we have the most abundant proof which must convince every man, be he soldier, be he sailor, or be he civilian, that our welfare as a nation, and the success of our great and powerful arms, most essentially depend upon the successful cultivation of science; and therefore any Institution which tends to encourage and promote science, must be a national benefit. With these feelings, gentlemen, I must, if you will allow me, congratulate you upon perceiving that which I hope I may accept as conclusive proof of the prosperity of this Institution (I have already adverted to the fact), namely, the presence of the influential and distinguished men who are supporters of this Institution. I find detailed again in this Report that the accession of new Members has been beyond the usual average, and that there is every indication of the rapid, steady, and progressive improvement of this Institution. And perhaps the best proof of that that we could have received—more valuable even than the statement of my honourable and excellent friend the Chairman of the Council—may be found in the statement which I heard with great interest made to-day by a very distinguished Naval Officer, Sir Frederick Nicolson, who has lately returned from doing most excellent service for his country in China. Sir Frederick Nicolson told you that in the fulfilment of his duties he has been many years away on Foreign Service, and he returned after an interval—not after watching this Institution, as you have done, from year to year, or I may say from day to day; and what does he tell you upon coming back after that period of absence? That he finds the greatest possible signs of improvement. Gentlemen, I most heartily hope that that improvement may long continue. I am quite sure with your 10,000 volumes—with your models of machinery—I am glad to find that you have the best naval models and the best naval charts—with all those advantages, guided as you are by a competent Council, guided by the light of good judgment and good sense in the administration of your affairs, I cannot resist the impression that the continued prosperity of this Institution must be a continued advantage to the country. It was with this full belief that I felt it my duty at once to accede to the request which my gallant friend Colonel Lindsay did me the honour to prefer to me, that, in consideration of my present position as First Lord of the Admiralty, I would preside here to-day. I repeat that my connection with that noble service makes me sincerely desire to do everything I can to promote its welfare. Gentlemen, I am most happy to have been amongst you to-day, and I heartily wish you continued prosperity.

STATEMENT OF CHANGES AMONG THE MEMBERS SINCE 1ST JANUARY, 1858:—

			Annual.		Life.		Total.
Number of Members on 1st January, 1858 .			2347	+	821	=	3168
Do. who have joined during 1858 .			209		12		221
			2556		833		3389
Changed from Annual to Life . . .			— 6		+ 6		
			2550		839		3389
	Annual.	Life.					
Deduct—Deaths during 1858 .	. 63	16					
Withdrawals . .	. 16						
Names struck off for non-payment . .	. 48						
			127		16		143
Number of Members on 1st January, 1859 .			2423		823		3246

TABULAR ANALYSIS OF THE STATE OF THE INSTITUTION,

To the 31st of December, 1858.

Year. 1st Jan. to 31st Dec.	Annual Subs. received.	Entrance Fees.	Income (from all sources).*	Life Subs. received.	Amount of Stock.	Invested in the purchase of Books, &c.	No. of Vols. in Library.	No. of Members on the 31st Dec.	Number of Visitors.
	£	£	£	£	£	£			
1831	654	..	654	1,194	..	..	..	1,437	..
1832	1,146	..	1,146	973	..	..	..	2,699	..
1833	1,405	..	1,450	692	..	..	..	3,341	..
1834	1,500	..	1,549	583	1,100	..	..	3,748	13,376
1835	1,480	..	1,574	366	2,430	40	..	4,155	8,537
1836	1,570	..	1,682	330	3,747	45	..	4,069	8,521
1837	1,549	..	1,747	222	4,747	180	..	4,164	10,907
1838	1,462	..	1,634	230	5,500	246	..	4,175	15,788
1839	1,399	..	1,565	168	5,500	292	..	4,186	16,248
1840	1,363	..	1,525	198	5,500	446	5,500	4,257	17,120
1841	1,450	..	1,643	186	6,000	243	5,850	4,243	19,421
1842	1,373	..	1,565	144	6,400	373	6,450	4,127	21,552
1843	1,299	..	1,494	140	6,700	237	7,000	4,078	27,056
1844	1,274	..	1,408	112	3,000	298	7,850	3,968	22,767
1845	1,313	..	1,466	228	1,500	127	8,100	3,988	21,627
1846	1,298	..	1,456	138	1,500	74	8,410	4,031	32,885
1847	1,314	74	1,502	132	1,700	37	..	4,017	38,699
1848	1,175	57	1,375	48	1,700	85	9,641	3,947	37,140
1849	1,176	72	1,375	84	1,150	58	..	3,970	33,333
1850	1,141	106	1,294	198	600	36	..	3,998	33,773
1851	1,136	131	1,292	66	666	34	10,150	3,188	52,173
1852	1,134	133	1,281	114	200	43	10,300	3,078	20,609
1853	1,243	319	1,684	264	528	41	10,420	3,251	25,952
1854	1,200	138	1,368	126	612	95	10,587	3,171	22,661
1855	1,159	107	1,289	120	653	55	10,780	3,131	14,778
1856	1,216	197	1,519	156	761	47	10,832	3,204	16,184
1857	1,258	176	1,937	78	1,038	40	10,960	3,168	12,755
1858	1,318	221	2,102	105	438	31	11,062	3,246	25,747

* Including Annual Subscriptions, Entrance Fees, Donations, Legacies, and Interest on Funded Property; and also the grant from Government, commencing in 1857.

LIST OF MEMBERS WHO HAVE PAID

INCREASED SUBSCRIPTIONS DURING THE YEAR 1858.

	£	s.	d.
Abbott, *Sir* Fred. Colonel Bengal Army (CB.)	1	0	0
Addison, J. E. Lt.-Col. Member Board of Education	1	1	0
Airey, J. M. C. Lieut. R.N.	1	0	0
Airey, *Sir* Rd. Maj.-Gen. (KCB.)	1	0	0
Ainslie, H. T. Col. (ret.) 83rd Regt.	1	1	0
Angerstein, J. J. W. Maj.-Gen.	1	0	0
Austin, Thos. Colonel unatt.	1	0	0
Aylmer, *Lord* (K.C.B.) Admiral	1	0	0
Back, *Sir* George Rear-Adm.	1	0	0
Baillie, J. Capt. 26th Bengal N.I.	1	1	0
Baird, J., M.D.	1	0	0
Barrow, J., Esq.	1	0	0
Bayly, V. T. Capt. 54th Regt.	0	15	0
Belgians, H. M. King of	2	0	0
Bell, W.M. Captain 3d Lt. Drs.	1	1	0
Benson, G. T. Capt. Dep. Batt.	1	0	0
Bentinck, *Sir* H. J. Maj.-Gen. Col. 28th Regt.	1	0	0
Beresford, *Rt. Hon.* W.	1	0	0
Berkeley, E. S. Lt. Life Gds.	1	0	0
Bethune, C. R. D. Rear-Admiral (CB.)	1	0	0
Bigge, H. M. Col. Northumb. Mil.	1	0	0
Bowles, *Sir* Geo. Lt.-Gen. (KCB.)	1	0	0
Brien, C. R., M.D. Surg. R.N.	1	0	0
Bromley, *Sir* R. M. (KCB.) Acct.-Gen. of the Navy	1	0	0
Brotherton, *Sir* T. W. (KCB.) Lt.-Gen.	1	0	0
Bruce, *Hon.* Robt. Col. late Gn. Gds.	1	0	0
Bunbury, H. W. Colonel (CB.)	1	0	0
Burlton, W. Colonel Bengal Army (CB.)	1	0	0
Cameron, D. A. Maj.-Gen. (CB.) V.-Pres. Bd. of Education	1	0	0
Carnac, J. R. Rear-Adm.	1	0	0
Cartwright, H. Col. late Gr. Gds.	2	0	0
Carr, R. Capt R.M.	1	0	0
Chapman, F.E. Col. R.E. (CB.)	1	0	0
Codrington, H. J. (C.B.) Rear-Admiral	1	0	0
Codrington, *Sir* W. J. Lieut.-Gen. (KCB.)	2	0	0
Cooke, W. B. Lieut. late 85th Regt.	1	0	0
Craufurd, J. R. Maj.-Gen.	1	0	0
Dacres, *Sir* R. J. Maj.-Gen. R.A. (KCB.)	1	0	0
Dalrymple, *Lord*	1	0	0
Damer, S. L. W. D. Capt. Gn. Gds.	1	0	0
Davidson, John Surgeon (ret.) Bengal Army	1	0	0
Doherty, *Sir* Rd. Lt.-Gen.	1	0	0
Dolby, J. E. A. Capt. late N. Y. Rif.	1	0	0
Douglas, W. Lt.-Gen. (ret.) R.A.	2	0	0
Drummond, B. Lt.-Gen.	1	0	0
Ducie, *Lord* Lord.-Lieut. of Gloucestershire	1	0	0
Dunne, F. P. Lt.-Col. unatt.	1	0	0
Dynevor, *Lord* G. R. Colonel	1	0	0
Edwards, Peter Maj.-Gen.	1	0	0
Egerton, C. R. Commr. R.N.	1	0	0
Egerton, *Sir* Philip Grey	1	0	0
Finch, *Hon.* J. Lt.-Gen. (CB.)	1	10	0
Fonblanque, J. S. M., Esq. Lieut. h.p. 21 Fus.	1	0	0
Fothergill, Thos. Colonel	1	0	0
Fraser, *Hon.* A. E. Major Colds. Gds.	1	0	0
Fraser, Danl. Col. (ret.) 42nd Regt.	1	0	0
Gage, *Hon.* E. Hall Major	1	0	0
Gardiner, Thos., Esq. late H.E.I.C.S.	1	0	0
Gascoyne, E. F. Maj.-Gen.	1	1	0
Gawler, G. Col. unatt. (KH.)	1	0	0
Gleig, Rev. G. R. Chap.-Gen.	1	0	0
Gordon, *Hon.* A. Colonel (CB.) Deputy Q. M. General	1	0	0
Gordon, J. late 47th Regt.	1	0	0
Gordon, R. Rear-Admiral	1	0	0
Gore, Montague Major	1	0	0
Graham, Lumley, Lt.-Col. unatt.	1	0	0
Grant, J. Capt. h.p. R.A.	1	0	0
Greene, Godfrey T. Colonel Bengal Army	1	0	0

	£	s.	d.
Guthrie, C. S. Col. Ben. Eng.	1	0	0
Hallett, C. W., *Esq.* Navy Agt.	1	0	0
Hamilton, F. W. Col. Gr. Gds. (CB.)	1	0	0
Hamley, E. B. Lt.-Col. R.A.	1	0	0
Hardinge, C. S. *Lord* Maj. Kent Mil. Art.	1	0	0
Hart, H. G. Lt.-Col. unatt.	1	0	0
Hatton, E. H. Finch Capt. North. Mil.	1	0	0
Hindmarsh, *Sir* J. (KH.) Rear-Adm.	1	0	0
Ingram, A. H. Capt. R.N.	1	0	0
Irby, Jno. J. C. Capt. & Adj. Chels. Hosp.	1	0	0
Jefferson, R. Capt. late Ceylon Rifles	1	0	0
Jervoise, W. F. D. Maj. R. E.	1	1	0
Kennedy, J. C. Lieut.-Col. (CB.) Ass. Quar.Mr.Gen. Aldershot	1	0	0
Kennedy, J. Pitt Col.	1	0	0
Knollys, W. T. Maj.-Gen.	1	0	0
Law, *Hon.* H. S. Capt.	1	0	0
Lightfoot, T. Maj.-Gen.	1	0	0
Lindsay, *Hon.* Jas. Col.Gr.Gds.	2	0	0
Lindsay, R. J. Major	1	0	0
Macpherson, E. Major.	1	0	0
Mildmay, H. A. St. J. Lieut. Rif. Brig.	1	0	0
Money, Rowland Vice-Adm. (CB.)	1	0	0
Monins, E. Maj.-Gen.	1	0	0
Monteath, W. Maj.-Gen.	1	0	0
Mundy, G. C. Col.	1	0	0
Murray, J. C. P. *Lord* Col.	1	0	0
Newdigate, F. W. Lt.-Col. Cold. Gds.	1	0	0
Nicolson, *Sir* F. Capt. R.N.	1	0	0
Okes, Lieut. C. R.N., K.W.	1	0	0
Paget, F. Col. late Cold. Gds.	1	0	0
Paulet, Lord Fred. Col. Colds. Gds.	1	0	0
Pennington, *Hon.* J. F. Capt. Rifle Brigade	1	0	0
Platen, Count, Swedish Minister	1	0	0
Raban, W. Col. (ret.)	1	0	0
Raper, H. Lieut. R.N.	1	0	0
Randolph, C. W. Lieut.-Col. Gr. Gds.	1	0	0
Randolph, G. G. Capt. R.N.	1	0	0
Rokeby, *Lord* Maj.-Gen. (KCB.)	1	0	0
Rooke, C. A. Lieut. H. A. Co.	1	0	0
Russell, D. Colonel Field Officer London (CB.)	1	0	0
Sabine, E. Maj.-Gen. R.A.	1	0	0
Saxe Weimar, H.S.H. Prince Edward, Col. Gr. Gds. (CB.)	1	0	0
Scott, *Sir* Sibbald D. *Bt.* Capt.	1	0	0
Seymour, W. F. Lt. Colds. Gds.	1	0	0
Sheil, *Sir* J. Col. Ben. Army (KCB.)	1	0	0
Skipwith, Geo. Maj. Dep. Batt.	1	0	0
Smart, Robt. Rear-Adm.	1	0	0
Smith, H. P. Lt. h.p. Rif. Brig.	1	0	0
Stanhope, P. S. Maj.-Gen.	1	0	0
Stephenson, F. C. A. Col. S. F. Gds.	1	0	0
Stovin, *Sir* F. Lt.-Gen. (KCB.)	1	0	0
Stuart, J. F. D. C. Lieut.-Col. Gr. Gds. M.P.	1	0	0
Sturt, C. N. Capt. Gr. Gds.	1	0	0
Sykes, W. H., MP. Col. Bomb. Army	1	0	0
Taylor, H. G. A. Gen. (CB.) Madras Army	1	0	0
Taylor, T. Col. Bengal Army	1	0	0
Taylor, T. M. Maj.-Gen.	1	0	0
Thomson, Harry Lt.-Gen. Bengal Army	1	0	0
Twemlow, Geo. Col. Bengal Army	1	0	0
Tyler, *Sir* Geo. *Kt.* Vice-Adm. (KH.)	1	0	0
Vacher, F. S. Maj. 33d Regt.	1	0	0
Walker, G.G. Capt. Dumf. Mil.	1	0	0
Wigram, E. D. Col. late Colds. Gds.	2	0	0
Wigram, J. R. Capt.	1	0	0
Wildman, J. Col. unatt.	1	0	0
Wilford, E. C. Col.	1	0	0
Wrottesley, *Hon.* Geo. Capt. R.E.	1	0	0
Wynne, W. Lieut. Cold. Gds.	1	0	0

LIST OF DONATIONS

FROM THE 1ST JANUARY TO 31ST DECEMBER, 1858.

		£	s.	d.
Bendyshe, Jno.	Capt. Camb. Mil.	1	0	0
Blamire, C.	Capt. 99th Regt.	5	0	0
Deacon, H.	Rear-Adm.	1	0	0
Dobie, R.	Surg. R.N.	0	10	0
Don, J., *Esq.*, MD.	Surg. (ret.) Bom. Army	0	10	0
Fox, C. R.	Lieut.-Gen.	3	10	0
Gascoyne, F. C. Trench, *Esq.*		20	0	0
Hawkins, Walter, *Esq.*, FSA.		5	0	0
Herbert, *Sir* Thos., KCB.	Vice.-Adm.	10	0	0
Hope, J., CB.	Rear-Adm.	6	10	0
James, Geo.	Col. R.A.	1	0	0
Jefferson,	Capt. late Ceylon Rif.	1	0	0
Lee-Jortin, H., *Esq.*	late R.H. Gds.	1	0	0
Lindsay, *Hon.* Jas.	Col. Gr. Gds.	20	0	0
Lewis,	Maj.-Gen. R.E.	2	0	0
	Carried forward	£78	0	0

		£	s.	d.
	Brought forward	78	0	0
Long, Sam.	Col. late Gr. Gds.	20	0	0
Macdonald, A.	Col.	1	1	0
Munro, D. A.	late Major	1	0	0
Narrien, J., *Esq.*, FRS. .	.	0	10	0
Nolloth, P. B.	Col. (ret.) R.M.	1	0	0
Nolloth, E.	Surg. R.N.	1	0	0
Oldmixon, J. W.	Capt. R.N.	1	0	0
Packe,	Capt. late R.H. Gds.	1	0	0
Pasley, *Sir* C. KCB.	Lt.-Gen.	1	0	0
Peel, *Right Hon.* J. Major-Gen.	Secretary of State for War	5	0	0
Pellew, *Hon. Sir* F. B. R. KCH.	Adm.	3	0	0
Pollock, *Sir* Geo., GCB.	Gen.	1	0	0
Powys, *Hon.* H. L.	Maj. unatt.	1	0	0
Robinson, W. T.	H. A. Co.	0	10	0
Sweny, M. H.	Capt. R.N.	0	10	0
Vyvyan, R. H. S.	Lieut. Cornwall Rang.	1	1	0
Yorke, Phil.	Col.	4	0	0
	Total . . .	£121	12	0

LIST OF NEW MEMBERS

WHO HAVE JOINED BETWEEN THE 14TH JUNE (THE DATE OF THE LAST EVENING MEETING) AND THE 31ST DECEMBER, 1858.

LIFE MEMBERS.

Freeland, H. W., Dep. Lieut. Sussex.
Phillimore, Aug. Captain R.N.
Lamb, H. Lieut. Indian Navy.

ANNUAL SUBSCRIBERS.

Walker, Chas. Fras., Lieut. R.N.
Sandys, Edwin W., Lieut. R.A.
Tollner, W. M., Lieut. R.A.
Farquharson, R. A., Ensign 24th Regt.
Parnell, A., Lieut. Royal Engineers.
Thursby, James L., Capt. 22nd Regt.
Cocks, Oct. York, Capt. 4th K. O. Regt.
Read, C. H., Lieut. Ceylon Rifles.
Hoste, Sir William, Capt. R.N.
Woolley, Joseph, LLD., H.M. Inspector of Schools.
Moseley, W. H., Ens. 60th Rifles.
Chinn, Edward, Ens. 4th K. O. Regt.
Scott, H. B., Bt.-Major 9th Regt.
Congreve, Wm., Lieut. 29th Regt.
Mildmay, Herbert A. St. J., Lieut. 4th Batt. Rifle Brigade.
De Vere, H. F. Major R. E.
Dundas, P. Col. (ret.) 47th Regt.
Rooper, Boufoy, late Lieut. 34th Regt.
Biddlecombe, Geo., Master R.N.
Baker, Francis B. A., Surg. S. F. Gds.
Elkington, A. G. A., Surg. S. F. Gds.
Hay, John, Lord, Captain R.N.
Blosse, W. C. Lynch, Capt., Roy. H. Art.
Croke, L. M., Lieut. R.N.
Blackburne, John Ireland, Lieut.-Col. 4th Roy. Lan. Militia.
Farrell, Sidney B., Capt. Royal Engineers.
Maycock, Jno. Geo., Capt. 1st Batt. 14th Regt.
Hall, Aug. W., Capt. 1st Batt. 14th Regt.
Lake, Henry Atwell, CB., Col. unatt. *ADC. to the Queen.*
Alexander, T. C. B., Director-General Army Med. Department.
Brockhurst, S. M. S., Lieut. 5th Royal Lancashire Militia.
Ford, James E., Lieut. Sco. Fus. Gds.
Slade, Charles G., Ens. 1st. Batt. Rifle Brigade.
Woolsey, O. B. B., Capt. Roy. Artillery.
Lovesy, Conway Withorne, Capt. South Gloucester Militia.
Dennis, Jas. Benjamin, Lt.-Colonel Roy. Artillery.
Dewell, Charles Goddard, Capt. 91st Highlanders.
Pim, Bedford, Capt. R.N.
Gibbon, Arthur, *Esq.*, Clerk, Acct.-Gen. Branch, War Office.
Wemyss, W. B., Lieut.-Col. Beng. Cav.
Le Grice, Frederick, Lieut. Roy. Artillery.
Waring, Walter T., Capt. Kent Artillery.
Wakeman, W. A. J., Ens. 2nd Royal Cheshire Militia.
Morgan, Horatio, Paymr. 43rd Light Inf.
Lawrence, Edw. E., Capt. Queen's Own Light Infantry Militia.
Robertson, Geo. S., Ens. 51st King's Own Light Infantry.
Bowie, Martinus Vankirkwyk, Adj. Edmonton Royal Rifles.
Byass, Francis, Ensign Edmonton Royal Rifles.
Smith, Jervoise, Captain Edmonton Royal Rifles.
Mahon, *Viscount*, Lieut. Gren. Guards.
Baylis, Edward, *Esq.*, Dep. Lieut. Middlesex.
Richardson, James, Colonel unatt.
Godson, Charles, Ass.-Surg. Edmonton Royal Rifles.

Boileau, J. T., Major-Gen. (ret.) Bengal Engineers.
Hughes, T. de Bashall, Lieut. Cape Mounted Rifles.
Hutton, F. W., Lieut. 23rd Royal Welsh Fusiliers.
Tabuteau, A. O., Lieut. 93rd Highlanders.
Grant, W. L., Col. K. O. Light Infantry Militia.
Gibb, Wm. Edwd., Lt.-Col. late 14th Madras N. I.
Lloyd, Thomas, Lieut. 35th Royal Sussex Regt.
Leslie, Arthur, Lieut.-Col. 40th Regt.
Villiers, Ernest, Ensign 43rd Light Infantry.
Knobel, Wm. Roberts, Ensign Essex Rifles.
Pepper, Geo. N., Lieut. 31st Regiment.
Chapman, Art. T. L., Capt. 34th Regiment.
Ingles, Henry A., Ensign 78th Highlanders.
Speirs, Arch. Alex., Lieut. Sco. Fus. Gds.
Marchant, C. H., Ensign 6th Regiment.
Whitbread, J. Wm. C., Captain Suffolk Militia Artillery.
Chesney, Chas. Cornwallis, Captain Royal Engineers.
Ostrehan, Eliott Leward, Lieut. 25th Bombay N.I.
Russell, David, CB., Colonel I.F.O. London.
Ducane, E. F., Capt. Royal Engineers.
Armstrong, Edw., Capt. 23rd R. W. Fus.
Lewis, Geo. Wm., Ensign 23rd R. W. Fus.
Berkeley, Rich. W. A., Surgeon 23rd R. W. Fus.
Robinson, T. P., Captain R.N.
Lowe, W. Drury, Capt., ADC. to Insp.-General of Cavalry.
Shanks, J. G., Lieut. Roy. Marine Light Infantry.
Fraser, Lionel M., Lieut. 41st Regt.
Sole, Henry Wm., Capt. 5th W. York Militia.
Hope, H. W., Lieut. Gren. Gds.
Uffington, W. A. F., Visct. Gren. Gds.
Bowden, H. G., Major 22nd Regt.

ADDITIONS TO THE LIBRARY AND MUSEUM

SINCE THE 14TH JUNE, 1858.

LIBRARY.—BOOKS.

(*The Donors' Names in Italics.*)

ANTIQUARIES (SOCIETY OF). Archæologia, Vol. XXXVII. Part II.
Proceedings of, Vol. IV. No. 47. *The Society.*

BOOKS, 15, viz.: Tide Tables, Sailing Directions, &c. *Lords Commissioners of the Admiralty.*

BRITISH ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE. Report of the Twenty-seventh Meeting of, held at Dublin in August and September, 1857. 8vo. *The Association.*

BUSK (Hans) Esq. The Rifle, and how to use it. 2nd Edition. 8vo. London, 1858. *The Author.*
3rd Edition. *Col. Colt.*

CAILLE (Jean de la). Description de la Ville et des Fauxbourgs de Paris. En Vingt Planches. Folio. Paris, 1714. *Lieut.-General Charles R. Fox.*

CALVER (Edw. Killwick) Esq. R.N. The Wave Screen. Pamph. 8vo. London, 1858. *The Author.*

CATALOGUE of the Birds in the Museum of the East India Company. 2 Vols. 8vo. London, 1854—1858.

CATALOGUE of the Mammalia in the Museum of the East India Company. 1 Vol. 8vo. London, 1851. *Hon. Court of Directors, late E.I.C.*

CIVIL ENGINEER and ARCHITECT'S JOURNAL, Nos. 1, 2, 3, 4, 5, 6, 7, to November, 1858, inclusive. *Mr. Jobbins.*

CLARKE (Hyde) Esq. D.C.L. A short Hand-Book of Comparative Philology. 12mo.
Pamph. London, 1858. *The Author.*

COLE (J. W.) Esq. Distinguished Generals during the Peninsular War. 2 Vols. 8vo. London, 1856. *The Author.*

CRAWFURD (John) Esq. F.R.G.S. Malay Grammar and Dictionary. 2 Vols. 8vo. London, 1852. *The Author.*

DAVIDSON (D.) Major H.E.I.C. Service. Description of Patent Apparatus for pointing Ordnance. Pamph. 8vo. London, 1855. *Capt B. Burgess, Sec.*

EDINBURGH (Royal Society of). Proceedings of. Sessions 1857, 1858. *The Society.*

ESTE (M. L.) Esq. M.D. F.R.C.S. Remarks on Railways. Pamph. 8vo. London, 1858. 2 copies.
Remarks upon the Drainage of London. Pamph. 8vo. 3 copies. *The Author.*

FONBLANQUE (E. B. de) Esq. Treatise on the Administration and Organisation of the British Army, with especial reference to Finance and Supply. London. 8vo, 1858. *The Author.*

FOX (A. Lane) Lt.-Col. Gren. Guards. Pamphlet on the Improvement of the Rifle as a Weapon for General use. 8vo. London. 1858. *The Author.*

GARDINER (Sir R.), General, K.C.B. K.C.H. Considerations of the Military Organization of the British Army, addressed to the House of Commons. 8vo. London, 1858. 3 copies.
Ditto, ditto, Addressed to H.R.H. the Duke of Cambridge, K.G. G.C.B. 8vo. London, 1858. 3 copies. *The Author.*

GIORNALE MILITARE. 7 vols. half bound, 8vo. from 1851 to 1857. *The Sardinian Government.*

GREENER, (W.) Esq. C.E. Gunnery in 1858. 1 vol. 8vo. With Plates. *The Author.*

HISTORY of the Great National Banquet given to the Victorious Soldiers returned from the Crimean War in the City of Dublin, October 22nd, 1856. Pamph. 8vo. Dublin, 1858. *Adj.-Gen., Dublin.*

LIARDET (Francis), Capt. R.N. Friendly Hints to Young Naval Lieutenants. Pamph. 8vo. London, 1858. *The Author.*

LEWIS (Maj.-Gen.) C.B. R.E. On the Defence of London, on Fortification, and on the Defensive Resources of England. Pamph. 8vo. London, 1857. *The Author.*

MEMORIAL de Ingenieros. Vol. XI. 8vo. 1854. *Major-General W. Wyld, C.B.*

NARRATIVE of Operations in the Arrangement and Formation of a Camp for 10,000 Infantry on the Curragh of Kildare. By the late Lieut.-Col. H. W.

Lugard, Asst.-Adj.-Gen. Royal Eng. 8vo. Dublin, 1858.
The Comptroller of H.M. Stationery Office.

NATIONAL Life Boat Institution (Journal of). Vol. IV. Nos. 29, 30, and 31.
The Institution.

NORK's German Dictionary. 8vo. Stuttgart, 1843. *Capt. Charles Caldwell.*

NAVAL Rank, as expressed by its present Titles, a Naval Wrong and a National Injury. Pamph. 8vo. London, 1858.
Commander Geo. Howes, R.N.

ORDNANCE Trigonometrical Survey of Great Britain and Ireland, Account of the observations and calculations of the principal Triangulation, and of the figure, dimensions, and mean specific gravity of the Earth as derived therefrom. Folio. Lond. 1858. Plates, &c. Folio. 1858. *Secretary of State for War.*

OWEN (Rd.) Rear-Admiral. A Nautical Memoir, descriptive of the Surveys made in H.M. ships "Blossom" and "Thunder" from 1829 to 1837.
The Author.

PAPERS:

1. Return of Trials for standard H.P. speed and consumption of coals at ordinary work.
2. Return of speed and consumption of coals at ordinary work, 1848—50.
3. Return of ditto ditto, 1857.
4. Return of issues of coal to check return of consumption, 1857.
5. Abstract of cost of renewal of boilers.
6. Return of shortest passages.

Considerations of steam vessels. Pamph. 12mo. 1856.

Memorandum for the British Association at its Meeting at Leeds in September, 1858, by Vice-Admiral Moorsom, on the performance of Steam Vessels. Pamph. 8vo. London, 1858.
C. R. Moorsom, Vice-Admiral.

PIM (Bedford) Commander R.N. F.R.G.S. Notes on Cherbourg. Pamph. 8vo. London, 1858. *The Author.*

RATHEAU (A.) Capitaine de Génie. Traité de Fortification. Octavo. Paris, 1858.

Ditto, ditto. Planches.
Picton Silke, Esq.

RENNIE (G.) Esq. C.E. Pamphlet on the quantity of Heat developed by water when rapidly agitated. *The Author.*

REPORT of the Registrar-General on the Progress and Statistics of Victoria. From 1851 to 1858. 8vo. Melbourne, 1858. *Norman Campbell, Esq.*

RHODES (G.) Captain 94th Regiment. Tents, Tent Life, and Encamping. 1 Vol. 8vo., with Engravings.
The Author.

ROYAL Agricultural Society of England. Journal of. Vol. XIX. Part 1, No. 41. *The Society.*

ROYAL Artillery Institution. Occasional Papers. Nos. 1, 2, 3, 4, 5, 6, and 7.
The Institution.

ROYAL Geographical Society. Proceedings of. Vol. II. No. 34. October, 1858. *The Society.*

ROYAL Institution of Great Britain. Notices of the Proceedings at the Meetings of the Members. Part VIII. November, 1857, July, 1858.
The Society.

ROYAL SOCIETY. Proceedings of. Vol. IX. Nos. 31, 32. *The Society.*

SAINT-BEUVE (M.) Lettres du Maréchal De Saint Arnaud. 2 Vols. 8vo. Paris, 1858. *Geo. Tomline, Esq., M.P.*

SELECTIONS from the Records of the Government of India:—

India, Nos. 3 and 8 (Supplement) 9 and 24.

Bengal, Nos. 7, 11, 13, 15, 17 and 24, 26, 27.

N. W. P., Nos. 6, 9 and 12, 14, 17, 19, 29, and Vol. I. Parts 1 and 3. Thomason's Despâtches, Vol. I.

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Hon. Court of Directors late E.I.C.

TIDSSKRIFT for Krigsvæsen, 1855, 56, 57. 3 vols. 8vo. Copenhagen.

TIDSSKRIFT for Søvæsen, 1856-57. 2 vols. 8vo. Copenhagen.
The Swedish Government.

TRERY (M. G.) C.E. Nos. 1, 2, 3, of a Study of Civil and Mechanical Engineering. Folio. London.
Mr. Jobbins.

UNITED STATES MAGAZINE. Vol. IV. No. 3. *Col. Colt.*

WILKINSON (Henry) M.R.A.S. &c. Observations on Muskets, Rifles, and Projectiles. 2 copies. 12mo.
Messrs. Wilkinson and Son.

ZOOLOGICAL SOCIETY, Proceedings of. Nos. CCCL. and CCCLXIII. from page 49 to 386. Transactions. Vol. IV. Part 5. *The Society.*

MAPS, PLANS, AND CHARTS.

2 Maps of Estramadura.
1 Map of the Port of Lisbon.
Major-General W. Wyld, C.B.
Chart of the Port of Cherbourg, 3 copies.
81 Charts.
Lords Commissioners of the Admiralty.
Carte Topographique des Environs du Camp de Beverloo, en 20 feuilles.
The Belgian Government.
2 French Assignats, 1792, 1793.
Captain A. C. Tupper.

AUTOGRAPHS.

A Letter from Dr. Horsley upon the Consecration of the Westminster Volunteer Cavalry Standards. *John Lettsom Elliot, Esq.*

DRAWINGS AND ENGRAVINGS.

A Photograph of Bray's Traction Engine.
Messrs Lancaster.
Plate and Description of the Molossus Australis (Gray), a rare species of Bat in the Museum of the United Service Institution, the only specimen in Europe.
J. Gould, Esq., F.R.S.

MUSEUM.

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Arms, Accoutrements, and Clothing of a Soldier of the Line and Rifleman of the Prussian Service.
The Prussian Government.
46 Models and Specimens of Mining Apparatus.
Secretary of State for War.
Small Model of the Battle of Leipsic.
Captain McCoy, Denbigh Militia.
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The Austrian Government.
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Secretary of State for War.
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Kukri Knife taken from a Sikh Soldier at the Battle of Sobraon by Lieut. J. Barnes, who cut the man down.
Jas. Isaake, Esq.
Rifle Battering-ram. Seven Improved Elongated Rifle Bullets. Two Spinsters.
Captain Norton.
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Bought and Presented by Capt. E. J. Ottley.
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Pioneer's Sword, saw-backed, and Scabbard. *Secretary of State for War.*
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Musket Self-Primer (1844), manufactured at St. Etienne.
French Breech-Loader (1840).
Messrs. Wilkinson and Son.
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W. R. Knobell, Esq. Essex Rifles.
Double Sword taken out of a rebel boat at Whampoa in 1856.
R. W. Clarke, Esq. R.N.
Breech-loading Needle Gun (J. Needham's Patent, 1851).
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Self-priming Musket to use the Flange Cap. *Mr. J. Needham.*
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Frederick Lack, Esq.

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Buoy or Float with canvas seat, made like petticoat trowsers, to be worked with a single whip, for hauling persons on shore from a stranded vessel.

Buoy or Float with band of canvas for seat, to be used as above (both with small figures).
Commander Kisbee, R.N.

A Section of E. R. Calver's Wave Screen.
E. R. Calver, Esq.

A model of a Three-Decker in glass case and stand. *Capt. T. P. Robinson, R.N.*

A portion of the first original Submarine Telegraph, invented and laid down in New York Harbour by Col. Colt. See page 248, No. 3, Vol. IV. United States Magazine. *Colonel Colt.*

Model of the Life Belt invented by Capt. Ward, R.N., and adopted by the Royal National Life Boat Institution, and worn by the crews of their life-boats.
Capt. Ward, R.N.

MISCELLANEOUS.

A Piece of Brocade from a train worn by Lady Nelson, Wife of Admiral Lord Nelson, on the day she received H.R.H. Prince William Henry, who had come to pay her his congratulatory visit after her marriage.

A Piece of Embroidery worked by Lady Nelson when attending her husband after the amputation of his arm.
Miss M. E. Nelson.

A Piece of Quartz containing gold from Melbourne, Australia.
Gen. Sir Michael Creagh, K.H.

Specimen of Lead Ore from the Geraldine Mine, Western Australia.
Thomas Banister, Esq.

A Dollar struck by a ball at the distance of 100 yards, fired from a rifle made by the foreman to Mr. Purdey, gunmaker. *Mr. Fenton.*

An ancient Flint Lock from Spain, probably of English manufacture, date about 1678. *G. Rickards, Esq.*

Specimens of Gyrophora Hyperborea, or Tripe de Roche. It grows on the rocks, and is abundant on the barren grounds towards the Arctic Sea, near the Coppermine River, North America. Sir George Back and his companions subsisted on it for some days when returning from the Arctic Sea in 1821.
Rear-Admiral Sir Geo. Back, D.C.L.

Whip made from the Lace-bark Tree, the handle and thong all in one piece.
Mr. Nightingale.

Skull found in an ancient tomb at Cranea in the Island of Cephalonia about the year 1834.
Lt.-Col. Thomas St. Leger Alcock.

The Standards of the Westminster Volunteer Cavalry, 1794, of which his father was the Lt.-Col. Commandant.

Two Exchequer Tallies saved from the fire at the Houses of Parliament in 1834.

Officer's Cap of the Westminster Volunteer Cavalry, 1794.
John Lettsom Elliot, Esq.

A Ball Pouch made in the Deccan, India.
Captain Boughey Burgess.

The Commission of John Elliot, Esq., as Lt.-Col. Comt. of the Westminster Volunteer Cavalry, signed by Geo. III.
John Lettsom Elliot, Esq.

Collection of Butterflies and Seed Vessels from Hong Kong. *Alfred Geary, Esq.*

Dress and Undress Sword (Officer's) of the Westminster Volunteer Cavalry.
John Lettsom Elliot, Esq.

The Burgee, the only flag flying on board of "La Prima," the largest French galley at Genoa. Captured by Lieut. Gibson, R.N., May 20, 1800.
Mrs. Gibson.

Australian Implements, viz., 1 wammera, 2 waddies. *Capt. Elliott, 99th Regt.*

Saxon Spearhead found at Broughton Poggs, Oxfordshire.
J. Y. Akerman, Esq.

Native Implements, Boomerang, series of Shells, &c., from Shark Bay, West Australia.
Lords Commissioners of the Admiralty.

Two Spears ornamented with shells and feathers from the neighbourhood of Port Essington, N. Australia.
Capt. A. C. Tupper.

Two Lava Buttons worn by Lord Nelson, and given by him to the widow of Adm. the Hon. Wm. Clement Finch.
J. Finch, Esq., in the name of the family of the late Adm. Finch.

Skull of Wild Sheep of Thibet (Ovis Ammon). *Col. Wemyss, Beng. Cav.*

Shell taken out of the Stomach of a Shark caught at Sierra Leone.
Capt. J. R. Ward, R.N.

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LIST OF MEMBERS

OF THE

UNITED SERVICE INSTITUTION,

CORRECTED TO THE

1st JANUARY, 1859.

WHITEHALL YARD, LONDON.

[JANUARY, 1859.]

Officers wishing to become Members of the United Service Institution may fill up one of the subjoined Forms,—tear out the leaf, and enclose it to the Secretary:—

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_______________ 185

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_______________ Signature.

_______________ Qualification for Membership.

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_______________ Signature.

_______________ Qualification for Membership.

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Dutton, Wm. Holmes Col. unatt.

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Edwards, Sampson Lieut. R.N.
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Eversley, VISCOUNT Col. Commt. Hampsh. Yeo.
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Ewart, David Col. (ret.) Bengal Artillery
Eyres, Harry, CB. Capt. R.N.

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Farquharson, F. CB. Lt.-Gen. Bomb. Army

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Fitzwygram, F. W. J. Capt. Inniskilling Dgs.
Fletcher, E. C. Col. h.p. 3rd Drag. Gds.
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Fraser, W. Major-Gen. (ret.) R.A.
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Holdsworth, T. W. E. Col. h.p. Dep. Q. M. Gen. Nova Scotia
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Hope, Jas. CB. Rear-Admiral
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Houstoun, Wallace Capt. R.N.

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Hutton, F. Capt. R.N.

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Janvrin, F. late Ensign 20th Regt.
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Johnson, W. S. Capt. late Lt. 83rd Regt.
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Johnstone, J. Julius Lieut. Gr. Gds.
Johnstone, H. Wedderburne Commr. R.N.
Johnstone, J. Lt.-Col. late 99th Regt.
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Kelly, Wm. Capt. R.N.
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Lloyd, John H. Lieut. R.N.
Lloyd, Mark late Capt. unatt.
Lloyd, William, M.D. Surg. h. p. 36th Regt.
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Long, Samuel Lieut.-Col. late Gren. Gds.
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Loyd, W. K. Lt.-Col. (ret.) Madr. Art.
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Luce, William Com. R.N.
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Lygon *Hon.* Edw. Pyndar, C.B. General, Col. 13th Light Drags.

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Macbean, Archibald Col. (ret.) R.A.
M'Call, S. late Lieut. 5th Drag. Gds.
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Macdonald, Alex. Lieut.-Col. late 68th Regt.
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Molyneux, E. Lieut. 7th Drag. Gds.
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Ramsay, W. M. Col. 62nd Beng. N. I.
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Rooper, John late Capt. Rifle Brig.
Roscow, S. Commr. R.N.
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Ross, George Capt. R.E.
Ross, *Sir* James Clark, FRS. Rear-Adml.
Rous, *Hon.* H. J. Vice-Adm.
Rowan, *Sir* Wm. KCB. Lt.-Gen. Col. 19th Regt.
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Russell, *Sir* Wm. *Bart.* Lt.-Col. 7th Hussars

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Saumarez, *Hon.* J. St. Vincent Col. late 16th Light Dragoons.
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Scott, Duncan G. Lt.-Gen. Beng. Army
Scott, George Rear-Admiral
Scott, Geo. Fred. Cooper Col. (ret.) 76th Regt.
Scott, James Rt. Capt. late 4th Dr. Gds.
Scott, John Binney Lieut. R.N.
Seale, F. R. Esq. F.G.S. late St. Helena Regt.
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Seymour, *Sir* G. F. KCB. GCH. Admiral
Seymour, H. late Major 23rd R. Welch Fus.
Seymour, *Sir* Michael Rear-Adm. KCB.
Seymour, W. H. Lt.-Col. 2nd Drag. Gds.
Shadwell, Chas. F. A. Capt. R.N. C.B.
Sharp, H. J. late Major 86th Regt.
Shawe, R. F. late Major unatt.
Shearman, John Major late 48th Regt.
Shelly, J. Nicholas Surg h.p. Greek Lt. Inf.
Sherer, Joseph, KH. Capt. R.N.
Shipley, Conway M. late Lieut. R.N.
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NOTICES TO MEMBERS.

CANDIDATES.

1. The following Officers have a right to become at once MEMBERS of the UNITED SERVICE INSTITUTION WITHOUT BALLOT, upon paying their Entrance Fee and Annual Subscription, viz.—

Princes of the Blood Royal; Officers of the Navy, Army, Marines, Yeomanry, Militia; East India Company's Land and Sea Forces; Lord Lieutenants and Deputy Lieutenants of Counties.

2. CANDIDATES LIABLE TO BE BALLOTED FOR.—Retired Officers; Civil Functionaries who are, or have been, attached to the Naval and Military Department; Navy and Army Agents; and Candidates for Commissions above the age of fifteen, whose names are on the List of the Commander-in-Chief for Commissions in the Army.

SUBSCRIPTION.

1. An Entrance Fee of One Pound on joining the Institution.

The payment of a sum of *not less* than SIX POUNDS, in addition to the Entrance Fee, constitutes a Member for Life.

The Annual Subscription shall be *not less* than TEN SHILLINGS, due on the 1st of January each year.

2. When a Member joins the Institution on or after the 1st of October, he will not be charged the Annual Subscription on the following 1st of January, but it will become due in the subsequent January, fifteen months afterwards.

ADMISSION.

1. Members serving abroad, or non-resident in the United Kingdom, are entitled to an Absent Member's ticket, which will admit

their friends to see the Museum. The name and address of the person in whose charge this ticket is given must be transmitted to the Secretary and appear on the ticket; which must be renewed at the commencement of every year.

2. The Museum is open from 11 to 5 in summer, and 11 to 4 in winter. Printed tickets for the admission of parties can be had on application to the Secretary. These tickets are available every day except Friday, on which day Members only can personally introduce their friends.

3. Members can admit two friends to the Lectures and Evening Meetings; either by *personally* introducing them, or by tickets, which can be procured from the Secretary, except upon special occasions, when due notice will be given.

4. Soldiers and sailors in uniform are admitted without tickets to see the Museum, Fridays excepted.

5. Inventors and Patentees, whose inventions are placed in the Exhibition Room, may have a limited number of tickets for the admission of their friends, on personal application to the Secretary.

THE JOURNAL.

1. Members of the Institution are entitled to receive the Journal free of charge, so long as the funds admit of it.

2. New Members are not entitled to receive the numbers of the Journal published before they join; but they, or other persons wishing to purchase the early numbers, can obtain them from Messrs. Mitchell, the publishers to the Institution, near the Admiralty. The price of each number is two shillings.

3. For the present, the Journal will be sent, free of expense, to all Members in Great Britain whose addresses are known, or who signify their wish to receive it; and it will be transmitted to the head-quarters of each Colonial station for Officers serving abroad.

4. When each number of the Journal is ready for delivery, it will be advertised in the professional papers and in the 'Times.'

MUSEUM.

In consequence of the very limited space in the Institution, and of the decision of the General Meeting held on the 4th of January, 1858, the following are the rules under which presents will be in future accepted; and the Council now point out those objects which they think most desirable for the collection.

1. In zoology, the system adopted being that of keeping types of species, the Council will, at some future period, state the various specimens which they may be auxious to obtain to complete the series.

2. Large stuffed animals cannot be accepted, unless they have some connection with a military operation, or have some remarkable or historical interest.

3. The Council are anxious to improve the collection in the following departments:

Armoury.—Arms of all nations in early and present times; armour of different periods; arms of distinguished warriors of all countries.

Models.—Military works, naval architecture; naval and military machines; implements of war.

Instruments or Models of the same.—In use for nautical astronomy; for geographical position; for military surveying.

Trophies and Relics.—Colours; standards; arms or other articles captured in action; or whatever may be of interest in illustrating the services of the navy and army.

Maps and Plans.—Surveys of officers; information as to fresh discoveries; alterations in harbours, forts, &c.; which may be useful to officers proceeding to foreign stations.

Library.—Works relating to naval and military seience and history; geography; travels and voyages; statistics; natural philosophy; mathematics; mechanics; astronomy; chemistry, &c. &c.

The Council trust that Members who publish will favour the Institution with a copy of their works.

4. When presents are received which are duplicates, or that do not come within the limitation determined on, and the donors are serving abroad, they will be taken care of by the Secretary until the pleasure of the donors shall be made known as to their future disposal.

5. The Council are anxious to afford inventors of articles of a naval and military character every facility for the full exhibition of their inventions; and will, on the recommendation of the Museum Committee, place them in their collection. If, however, space requires it, or if the invention becomes no longer available, the owner will be written to, to request his instructions as to its disposal.

6. The Council earnestly solicit communications from officers upon all branches of knowledge connected with both professions. They are anxious to receive information from officers serving in the field respecting details of operations, topography of countries, the effect of naval and military appliances, suggestions for improvement—such information to be read at the Evening Meetings by the Secretary.

7. Information respecting the Institution will be advertised in the "Naval and Military Gazette," "United Service Gazette," "The Wellington Gazette," and "The United Service Journal;" and notices of Lectures and Evening Meetings will be sent to the Clubs in London.